



Installation, Start-Up and Service Instructions

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SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguishers available for all brazing operations.

⚠ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury.

INSTALLATION

Step 1 — Provide Unit Support

⚠ CAUTION

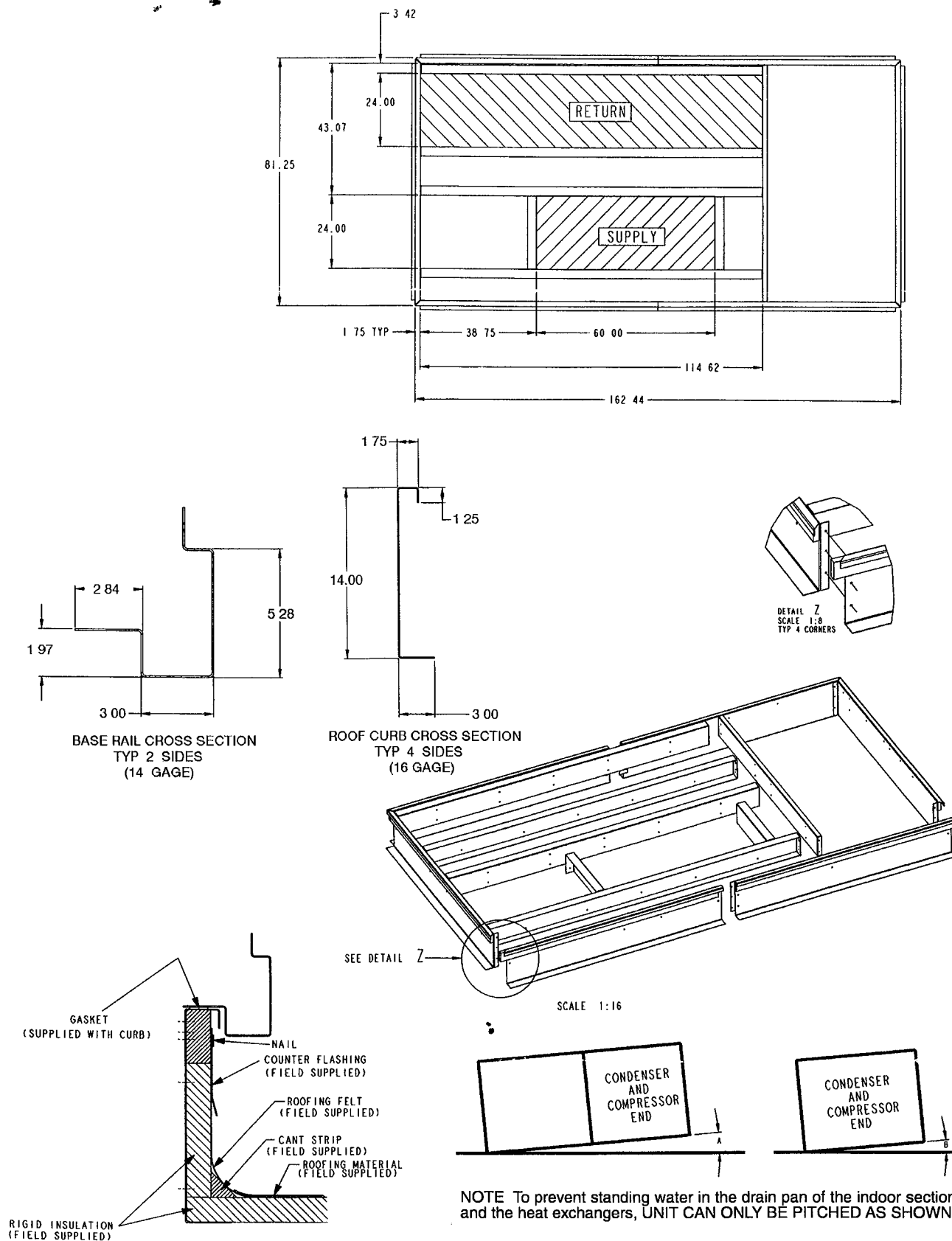
All panels must be in place when rigging. Unit is not designed for handling by fork truck.

ROOF CURB — Assemble and install accessory roof curb in accordance with instructions shipped with the curb. Accessory roof curb and information required to field fabricate a roof curb or horizontal adapter are shown in Fig. 1. Install insulation, cant strips, roofing, and counter flashing as shown. Ductwork can be secured to roof curb before unit is set in place.

IMPORTANT: The gasketing of the unit to the roof curb is critical for a leak-proof seal. Install gasket supplied with the roof curb as shown in Fig. 1. Improperly applied gasket can result in air leaks and poor unit performance.

Curb should be level. This is necessary to permit unit drain to function properly. Unit leveling tolerance is shown in Fig 1. Refer to Accessory Roof Curb Installation Instructions for additional information as required. When accessory roof curb is used, unit may be installed on class A, B, or C roof covering material.

ALTERNATE UNIT SUPPORT — When the curb or adapter cannot be used, support unit with sleepers using unit curb or adapter support area. If sleepers cannot be used, support long sides of unit (refer to Fig. 2 and 3) with a minimum number of equally spaced 4-in. x 4-in. pads. 50EJQ, EWQ024 and 028 units require 3 pads on each side. Unit may sag if supported by corners only.



NOTES:

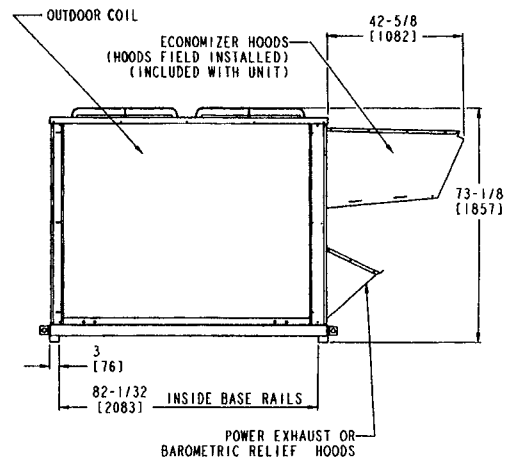
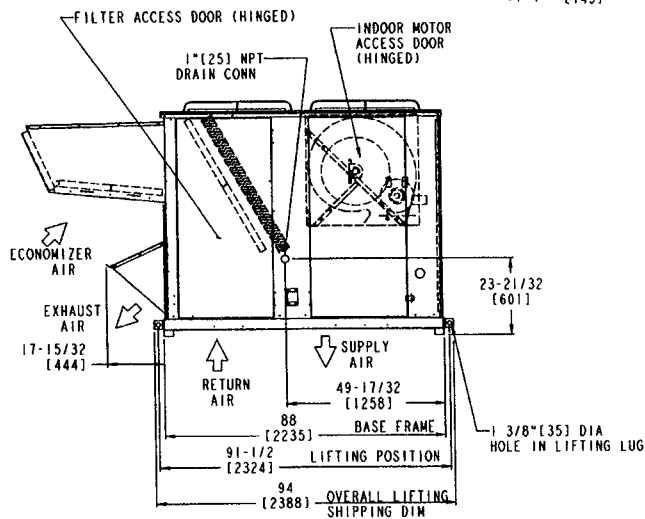
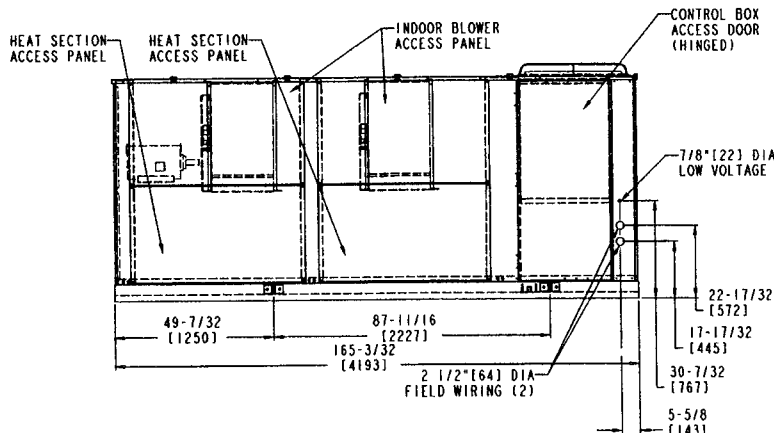
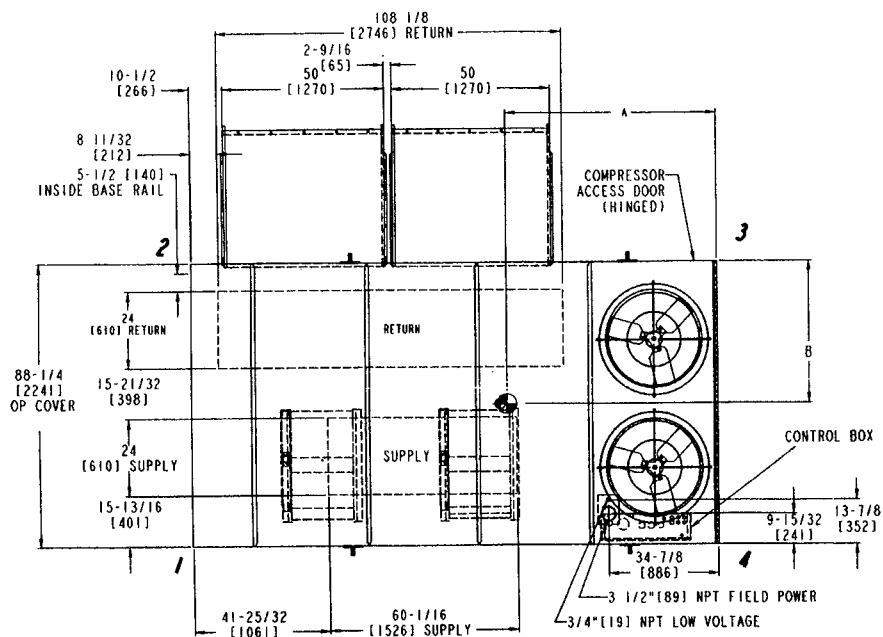
- 1 Unless otherwise specified, all dimensions are to outside of part.
- 2 Roof curb accessory is shipped disassembled
- 3 All roof curb parts are to be 16 ga galvanized steel
- 4 Dimensions are in inches.

UNIT LEVELING TOLERANCES DIMENSIONS* (Degrees and Inches)

A		B	
Deg.	in.	Deg.	in.
1.0	2.9	50	.75

*From edge of unit to horizontal

Fig. 1 — Roof Curb (Sizes 024 and 028)

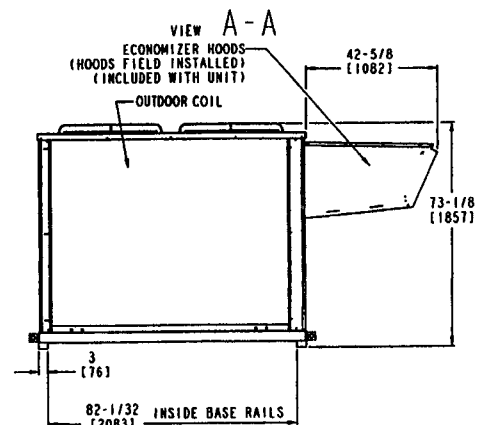
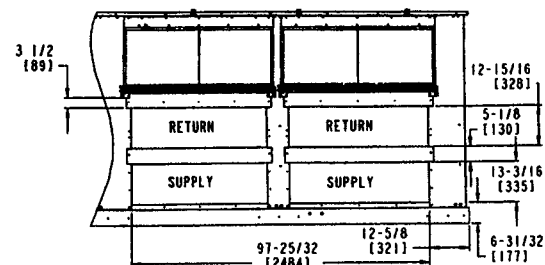
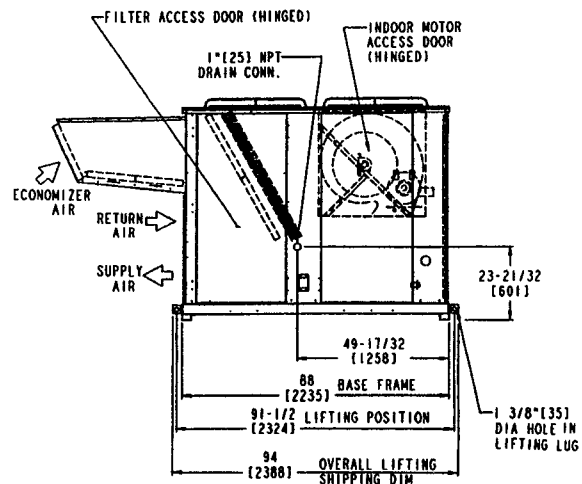
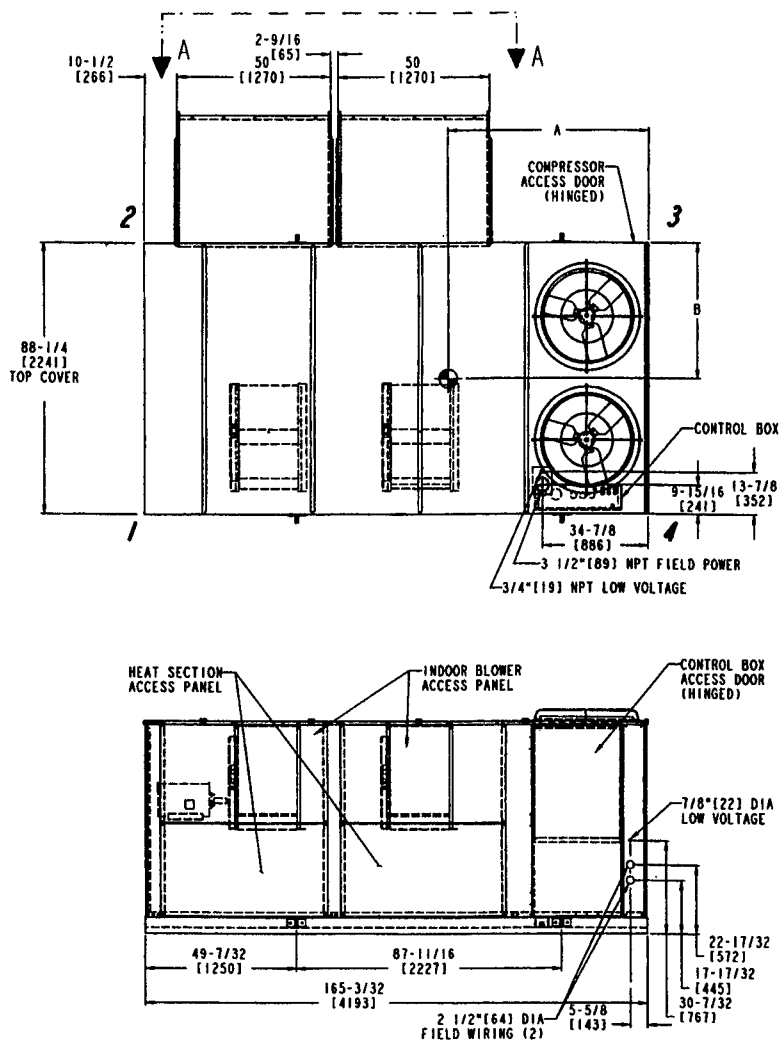


NOTES:

- Weights include economizer (Std)
- Center of gravity.
- Do not locate adjacent units with discharge facing economizer inlet. Minimum clearances to be:
Adjacent Units: 15'-0"
Top of Units: No overhang
Outdoor Coil: 4'-0"
Economizer Side: 6'-0"
Filter Access Side: 10'-0" (for removal of evaporator coil)
- For smaller service and operational clearances, contact Carrier Application Engineering department
- Bottom ducts designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on accessory roof curb
- Dimensions are in inches. Dimensions in [] are in millimeters
- For units with electric heat, a field-supplied 90° elbow must be installed in the supply ductwork below the unit discharge.

UNIT SIZE 50EJQ	OPERATING WEIGHT (lb)	A	B	CORNER WEIGHT (lb)			
		ft-in.	ft-in.	1	2	3	4
024	4168	5-7 ⁵ / ₈	3-7 ⁵ / ₈	843	859	1245	1222
028	4168	5-7 ⁵ / ₈	3-7 ⁵ / ₈	843	859	1245	1222

Fig. 2 — Base Unit Dimensions, 50EJQ024 and 028



NOTES:

- Weights include economizer (Std)
- Center of gravity
- Do not locate adjacent units with discharge facing economizer inlet. Minimum clearances to be:
 - Adjacent Units: 15'-0"
 - Top of Units: No overhang
 - Outdoor Coil: 4'-0"
 - Economizer Side: 6'-0"
 - Filter Access Side: 10'-0" (for removal of evaporator coil)
- For smaller service and operational clearances, contact Carrier Application Engineering department
- Dimensions are in inches. Dimensions in [] are in millimeters.
- For units equipped with electric heat, a field-supplied 90° elbow must be installed in the supply ductwork below the unit discharge
- For side-supply/return applications, a single return and supply ductwork connection is recommended for covering both return and both supply openings

UNIT SIZE 50EWQ	OPERATING WEIGHT (lb)	A	B	CORNER WEIGHT (lb)			
		ft-in.	ft-in.	1	2	3	4
024	4168	5-7 ³ / ₈	3-7 ³ / ₈	843	859	1245	1222
028	4168	5-7 ³ / ₈	3-7 ³ / ₈	843	859	1245	1222

Fig. 3 — Base Unit Dimensions, 50EWQ024 and 028

Step 2 — Rig and Place Unit — Inspect unit for transportation damage. File any claim with transportation agency. Keep unit upright, and do not drop. Use spreader bars over unit to prevent sling or cable damage. Rollers may be used to move unit across a roof. Level by using unit frame as a reference; leveling tolerance is shown in Fig. 1. See Fig. 4 for additional information. Unit weight is shown in Table 1.

NOTE: On retrofit jobs, ductwork may be attached to old unit instead of roof curb. Be careful not to damage ductwork when removing unit. Attach existing ductwork to roof curb instead of unit.

Four lifting lugs are provided on the unit base rails as shown in Fig. 4. Refer to rigging instructions on unit.

POSITIONING — Provide clearance around and above unit for airflow, safety, and service access (Fig. 2 and 3).

Do not install unit in an indoor location. Do not locate air inlets near exhaust vents or other sources of contaminated air.

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

ROOF MOUNT — Check building codes for weight distribution requirements.

Step 3 — Field Fabricate Ductwork — Secure all ducts to building structure. Use flexible duct connectors between unit and ducts as required. Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier.

To attach ductwork to roof curb, insert ductwork approximately 10 to 11 in. up into the curb. Connect ductwork to 14-gage roof curb material using sheet metal screw driven from inside the duct.

A 90-degree elbow must be used in the return duct or a straight return duct must terminate with a grille securely

attached, so that if tools are dropped while working on a unit, they will not enter the occupied space.

The units with electric heat require a 1-in. clearance for the first 24 in. of ductwork.

NOTE: A 90-degree elbow must be provided in the ductwork to comply with UL (Underwriters' Laboratories) codes for use with electric heat.

Outlet grilles must not lie directly below unit discharge.

Step 4 — Make Unit Duct Connections

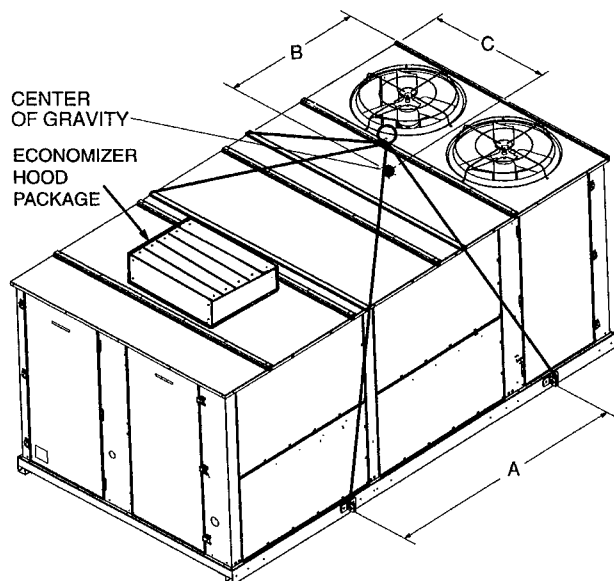
50EJQ UNITS — Unit is shipped for through-the-bottom duct connections. Ductwork openings are shown in Fig. 2. **Attach all ductwork to roof curb.** Air distribution is shown in Fig. 5. Refer to installation instructions shipped with accessory roof curb for more information.

50EWQ UNITS — Remove shipping covers from supply and return air openings. Attach field-supplied ductwork to unit. Use a single duct over **both** return openings and a single duct over both supply openings. See Fig. 3 for duct opening dimensions. Secure all ducts to the building structure. See Fig. 6. Use flexible duct connectors between unit and ducts as required.

Install accessory barometric relief or power exhaust in the field-fabricated return ductwork. Refer to Step 9 — Position Power Exhaust/Barometric Relief Damper Hood Section on page 15 for more information.

Step 5 — Trap Condensate Drain — See Fig. 2, 3, and 7 for drain location. Condensate drain is open to the atmosphere and must be trapped. Install a trapped drain at the drain location. One 1-in. FPT coupling is provided inside unit indoor section for condensate drain connection. A trap at least 4-in. deep must be used. Trap must be installed to prevent freeze-up.

Condensate pans are sloped so that water will completely drain from the condensate pan to comply with indoor air quality guidelines.



CAUTION

**NOTICE TO RIGGERS:
ALL PANELS MUST BE IN PLACE
WHEN RIGGING.**

NOTE: Rig with four cables and spread with two 92 in. (2337 mm) spreader bars. Maintain a distance of 74 in. (1880 mm) from top of unit to eyehook.

NOTE:

Add 32 lb (14.5 kg) for domestic crating.

Add 250 lb (113 kg) for power exhaust

Add 220 lb (100 kg) for copper condenser coil (024,028 units)

UNIT 50EJQ,EWQ	WEIGHT		A		B		C	
	lb	kg	in.	mm	in.	mm	in.	mm
024	4168	1891	87.68	2227	67.3	1711	43.6	1107
028	4168	1891	87.68	2227	67.3	1711	43.6	1107

Fig. 4 — Rigging Label

Table 1 — Physical Data

UNIT 50EJQ,EWQ	024	028
NOMINAL CAPACITY (tons)	20	25
OPERATING WEIGHT (lb)*		
Unit		
Al/Al†	4168	4168
Al/Cu†	4388	4388
Roof Curb (14-in. curb)	365	365
COMPRESSOR		
Type Ckt 1	06D824	06D328
Ckt 2	06D824	06D328
Number of Refrigerant Circuits	2	2
Oil (oz) (Ckt1, Ckt 2)	115 ea	115 ea
REFRIGERANT TYPE	R-22	
Operating Charge (lb-oz)		
Circuit 1**	32-2	33-3
Circuit 2	34-6	35-11
OUTDOOR COIL	Cross-Hatched 3/8" Copper Tubes, Aluminum Lanced, Aluminum Precoated, or Copper Fins	
Quantity	1	1
Rows...Fins/in.	4 15	4 15
Total Face Area (sq ft)	33.3	33.3
OUTDOOR FAN	Propeller Type	
Nominal Cfm	13,420	13,420
Quantity...Diameter (in.)	2 30	2 30
Motor Hp (1075 Rpm)	1	1
INDOOR COIL	Cross-Hatched 3/8" Copper Tubes, Aluminum Plate Fins, Face Split	
Rows...Fins/in.	4 15	4 15
Total Face Area (sq ft)	31.7	31.7
Expansion Device	Acutrol™ Device	
INDOOR FAN	Centrifugal Type	
Quantity...Size (in.)	2...20x15	2...20x15
Type Drive	Belt	Belt
Nominal Cfm	8,000	10,000
Motor Hp	5	7.5
Motor Frame Size	S184T	S213T
Motor Bearing Type	10††	10††
Maximum Allowable Rpm	1200	1200
Motor Pulley Pitch Diameter	4 6	4 9
Nominal Motor Shaft Diameter (in.)	1 1/8	1 3/8
Fan Pulley Pitch Diameter (in.)	11 1	11 1
Nominal Fan Shaft Diameter (in.)	1 1/16	1 1/16
Belt, Quantity...Type	1 BX59	1 BX56
Belt, Length (in.)	62	59
Pulley Center Line Distance (in.)	16 0-18 7	15.6-18 4
Factory Speed Setting (rpm)	725	962
HIGH-PRESSURE SWITCH (psig)		
Cutout	426	426
Reset (Auto.)	320	320
LOW-PRESSURE SWITCH (psig)		
Cutout	7	7
Reset (Auto.)	22	22
RETURN-AIR FILTERS		
Quantity...Size (in.)	10...20x24x2	10...20x24x2
OUTDOOR-AIR FILTERS		
Quantity...Size (in.)	8 16x25	8 16x25
Fan, Diameter...Width (in.)	4 20x25	4 20x25
POWER EXHAUST	Direct Drive, 3-Speed, Single-Phase Motor (Factory-Wired For High Speed) and Forward Curved Fan	
Motor, Quantity...Hp	4...1	
Fan, Diameter...Width (in.)	11 10	

LEGEND

Al — Aluminum
Cu — Copper

*Weight of unit does not include barometric relief or power exhaust

†Indoor coil fin material/outdoor coil fin material

**Circuit 1 uses the upper portion of outdoor coil, Circuit 2 uses the lower portion. Circuit 1 uses the lower portion of the indoor coil, Circuit 2 uses the upper portion

††Motor and drive shown will deliver approximately 2.5 in wg net external static. For more drive information, see Table 2.

NOTE: See Table 2 for evaporator fan motor data

Table 2 — Evaporator Fan Motor Data

UNIT SIZE 50EJQ,EWQ	MOTOR HP	MOTOR SHAFT DIAMETER (in.)	FAN SHAFT SPEED (rpm)	MOTOR SHEAVE	MOTOR SHEAVE PITCH DIAMETER (in.)	BUSHING DIAMETER (in.)	FAN SHEAVE	FAN SHEAVE PITCH DIAMETER (in.)	BUSHING DIAMETER (in.)	BELT	OUTSIDE BELT LENGTH	BELT TENSION (Lb @ .24 in.)
024	5	1.12	725	BK52	4.6	None-1.125	1B5V110	11.1	B-1.6875	BX59	62	5.02
	10	1.38	924	BK72	6.6	None-1.375	1B5V124	12.5	B-1.6875	BX60	63	7.05
	15	1.62	1088	1B5V68	6.9	B-1.625	1B5V110	11.1	B-1.6875	5VX590	59	9.38
028	7.5	1.38	773	BK55H	4.9	H-1.375	1B5V110	11.1	B-1.6875	BX56	59	6.87
	10	1.38	962	BK67H	6.1	H-1.375	1B5V110	11.1	B-1.6875	BX56	59	7.26
	15	1.62	1119	1B5V70	7.1	B-1.625	1B5V110	11.1	B-1.6875	5VX590	59	9.17

NOTE: Motor shaft speed is 1750 rpm. The fan shaft diameter is 1 1/16 inches.

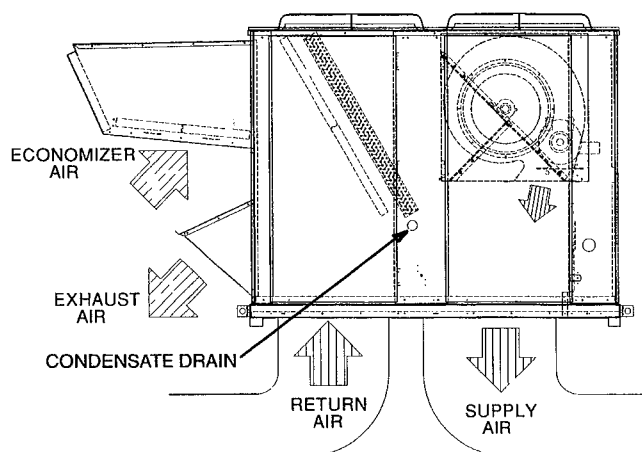


Fig. 5 — Air Distribution — Thru-the-Bottom

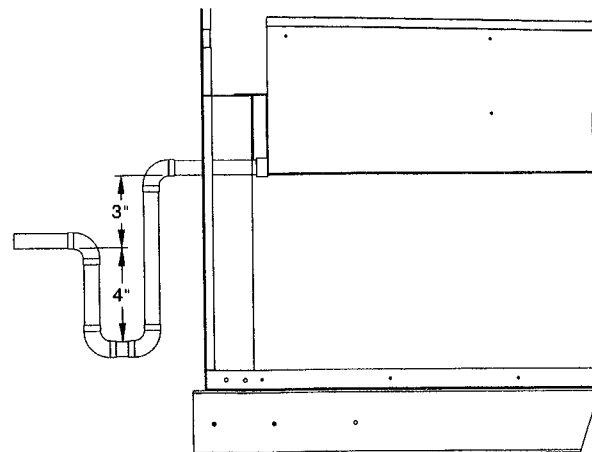


**Fig. 7 — Condensate Drain Connections
(Typical Roof Curb or Slab Mount Shown)**

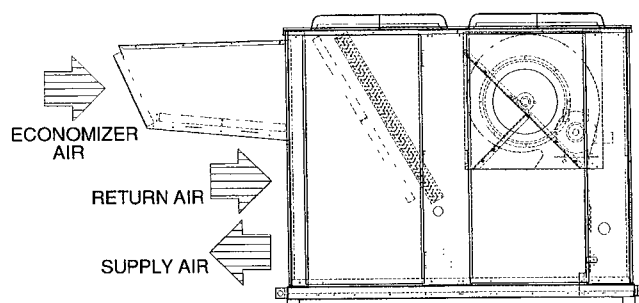


Fig. 6 — Air Distribution — Thru-the-Side

Step 6 — Controls Options — The control options that the units can provide are based on the following parameters: CV (constant volume) operation; stand-alone unit with field-supplied sensors installed; as a system via the Carrier Comfort System (TEMP); optional electronic expansion board installed, linked to the Carrier Comfort Network; and availability of a computer and software (ComfortWorks™, Building Supervisor, and Service Tool) to access the base control board. See Table 3.

NOTE: Access to the base control board allows unit occupancy schedules, unit timeclock, and various set points to be changed from their factory-defined default settings.

The standard heat pump unit is capable of being operated with either a Carrier-approved thermostat or a field-supplied sensor. (See Price Pages for ordering information.)

FEATURES WITH THERMOSTAT CONTROL OF UNIT

- two-stage heating (if installed)
- two-stage cooling
- control of unit using Y1, Y2, W1, W2, and G thermostat inputs
- control of the indoor fan
- outdoor air temperature/supply air temperature monitoring
- control of outdoor fan based on outdoor air temperature
- control of modulating economizer damper to provide free cooling when outdoor conditions are suitable, using supply air temperature as a control point
- control of the economizer damper and indoor fan to obtain unoccupied free cooling
- provide power exhaust output to an external power exhaust controller
- support a field test for field checkout
- control of 2 stages of power exhaust
- compressor Time Guard® device (power up and minimum off and on times)

Additional features are provided by accessing the standard unit control board via software with a computer. These features are:

- electronic expansion board features (if installed)
- compressor lockout during low supply air temperature
- control board diagnostics
- ability to change supply air set point (economizer control)
- ability to change high outdoor air temperature lockout set point (economizer control)
- ability to change power exhaust set points

NOTE: A unit without a thermostat requires a field-supplied sensor for operation.

FEATURES WITH SENSOR CONTROL OF UNIT (Stand-Alone Applications) — Unit control is limited to unoccupied default set points, 90 F for cooling, 55 F for heating. There are 2 sensor options available:

- T-55 sensor will monitor room temperature and provide unoccupied override capability (1 hour)
- T-56 sensor will monitor room temperature, provide unoccupied override capability (1 hour), and provide a temperature offset of $\pm 5^\circ$ F.

Standard features are:

- support of remote occupied/unoccupied input to start and stop the unit
- cooling capacity control of 3 stages using economizer and 2 compressors to maintain space temperature to an occupied or unoccupied set point
- enable heating (if installed) or cooling during unoccupied periods as required to maintain space temperature within the unoccupied set points
- adjustment of space temperature set points of $\pm 5^\circ$ F when using a T-56 sensor

Features with sensor control of unit with computer access are:

- 365-day timeclock with backup (supports minute, hour, day of week, date, month, and year)
- daylight savings time function
- occupancy control with 8 periods for unit operation
- holiday table containing up to 18 holiday schedules
- temperature compensated start to calculate early start times before occupancy
- access to the Display, Maintenance, Configuration, Service, and Set Point data table through network software

When the unit is equipped with a field-supplied space temperature sensor and a remote contact closure (remote start/stop) on the base control board, the occupied default set points will monitor unit operation. The occupied default set points are 78 F cooling and 68 F heating (if electric heat is installed). See Fig. 8 for remote start/stop wiring.

NOTE: For units which have not had the base unit control board accessed via software to set an occupancy schedule, the remote start/stop closure will allow the unit to operate in the pre-configured occupied default set points (based on return-air temperature) of 78 F cooling and 68 F heating. Without this feature, the unit will control to the unoccupied default set points of 90 F cooling and 55 F heating (if electric heat is installed).

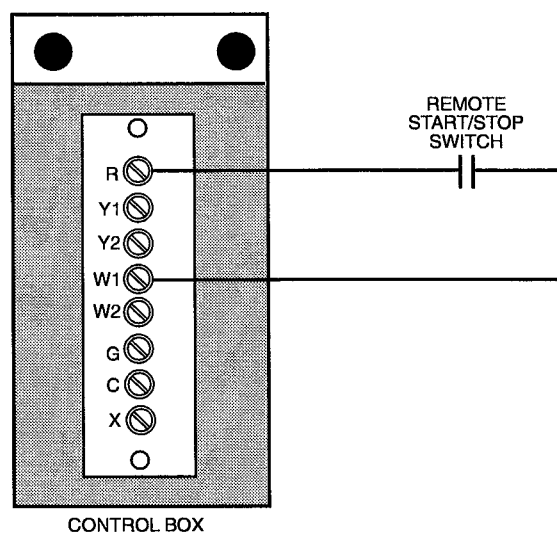


Fig. 8 — Field Control Remote Start/Stop

Table 3 — Controls Options and Configurations (Non-Thermostat Applications)

UNIT CONFIGURATION	DEFAULT COOLING	DEFAULT HEATING
Unit with SPT Sensor	Unoccupied Cooling — 90 F (SPT) Occupied Cooling — NA	Unoccupied Heating — 55 F (SPT) Occupied Heating — NA
Unit with SPT Sensor and Remote Start/Stop Switch	Unoccupied Cooling — 90 F (SPT) Occupied Cooling — 78 F (SPT)	Unoccupied Heating — 55 F (SPT) Occupied Heating — 68 F (SPT)

LEGEND

NA — Not Available SPT — Space Temperature

NOTE Space temperature sensor and remote stop/switch are field-supplied.

An electronic expansion board may be field-installed to provide the following features:

- control of modulating economizer damper to maintain indoor air quality (IAQ) when outdoor conditions are suitable
- provide discrete inputs for fan status, filter status, field-applied status, and demand limit
- provide an output for the external alarm light indicator

When the unit is connected to the CCN (Carrier Comfort Network), the following expansion board features can be utilized.

- perform Demand Limit functions based on CCN loadshed commands or the state of the discrete input
- alarm monitoring of all key parameters
- CCN protocol
- provides power exhaust fire outputs for direct control of modulated power exhaust stages during fire or smoke modes
- smoke control modes including evacuation, smoke purge, pressurization, and fire shutdown (modulating power exhaust required)

FEATURES WITH SENSOR CONTROL OF UNIT (Network Applications) — The base control board provides, as standard, a connection for integration into a Carrier Comfort Network.

When the unit is accessed via a PC equipped with ComfortWorks™, Building Supervisor, or Service Tool, the following features can be accessed:

- on-board timeclock can be programmed
- occupancy schedules can be programmed
- unit set points can be changed
- alarms can be monitored

This access is available on the base control board via a RJ-11 phone jack or a 3-wire connection to the communication bus. See Fig. 9. The timeclock has a 10-hour minimum back-up time to provide for unit power off for servicing unit or during unexpected power outages. For complete Carrier Comfort System (CCS) or Carrier Comfort Network (CCN) features and benefits, refer to the product literature.

Step 7 — Make Electrical Connections

POWER WIRING — Units are factory wired for the voltage shown on the unit nameplate. The main terminal block is suitable for use with aluminum or copper wires and is sized for single-point electric heat.

When installing units, provide a disconnect per NEC (National Electrical Code) of adequate size (MOCP [maximum overcurrent protection] of unit is on the informative plate). All field wiring must comply with NEC and all local codes. Size wire based on MCA (minimum circuit amps) on the unit informative plate. See Fig. 10 for power wiring connections to the unit power terminal block and equipment ground.

The main power terminal block is suitable for use with aluminum or copper wire. See Fig. 10. Units have circuit breakers for compressors, fan motors, and control circuit. If required by local codes, provide an additional disconnect, per NEC and local codes requirements, of adequate size (Table 4). Whenever external electrical sources are used, unit must be electrically grounded in accordance with local codes, or in absence of local codes, with NEC, ANSI (American National Standards Institute) C1-latest year.

All field wiring must comply with NEC and local code requirements.

FIELD POWER SUPPLY — Unit is factory wired for voltage shown on nameplate. See Table 4 for electrical data.

Field wiring can be brought into the unit from bottom (through basepan and roof curb) or through side of unit (corner post next to control box).

A 3/2-in. NPT coupling for field power wiring and a 3/4-in. NPT coupling for 24-v control wiring are provided in basepan. In the side post, there are two 2 1/2-in. knockouts for the field power wiring. See Fig. 2 and 3. If control wiring is to be brought in through the side of unit, a 7/8-in. diameter hole is provided in the condenser side post next to the control box.

If disconnect box is mounted to corner post, be careful not to drill any screws into the condenser coil.

Routing Through Bottom of Unit — If wiring is brought in through bottom of unit, use field-supplied watertight conduit to run power wiring from basepan out through bottom 3 1/2-in. hole to the disconnect box and back into unit to the main control box.

Use strain relief going into control box through 2 1/2-in. diameter hole provided. After wires are in unit control box, connect to power terminal block (see Power Wiring section on this page).

Low-voltage wiring must be run in watertight conduit from the basepan to control box and through 7/8-in. diameter hole provided in bottom of unit control box. Field-supplied strain relief must be used going into the box. After wiring is in control box, make connections to proper terminals on terminal blocks (see Field Control Wiring section on page 11).

Install conduit connector in unit basepan or side panel openings provided. Route power and ground lines through connector to connections in unit control box as shown on unit wiring diagram and Fig. 10.

Routing Through Side of Unit — Route power wiring in field-supplied watertight conduit into unit through 2 1/2-in. hole. Strain relief (field supplied) must be used in hole. See Fig. 10.

Use field-supplied strain relief going into control box through 2 1/2-in. diameter hole provided. After wires are in unit control box, connect to power terminal block (see Power Wiring section on this page).

Bring low-voltage control wiring through factory-drilled 7/8-in. diameter hole in condenser side post. Use strain relief going into 7/8-in. diameter hole in bottom of unit control box.

After wiring is in control box, make connection to proper terminals on terminal blocks (see Field Control Wiring section on page 11).

⚠ WARNING

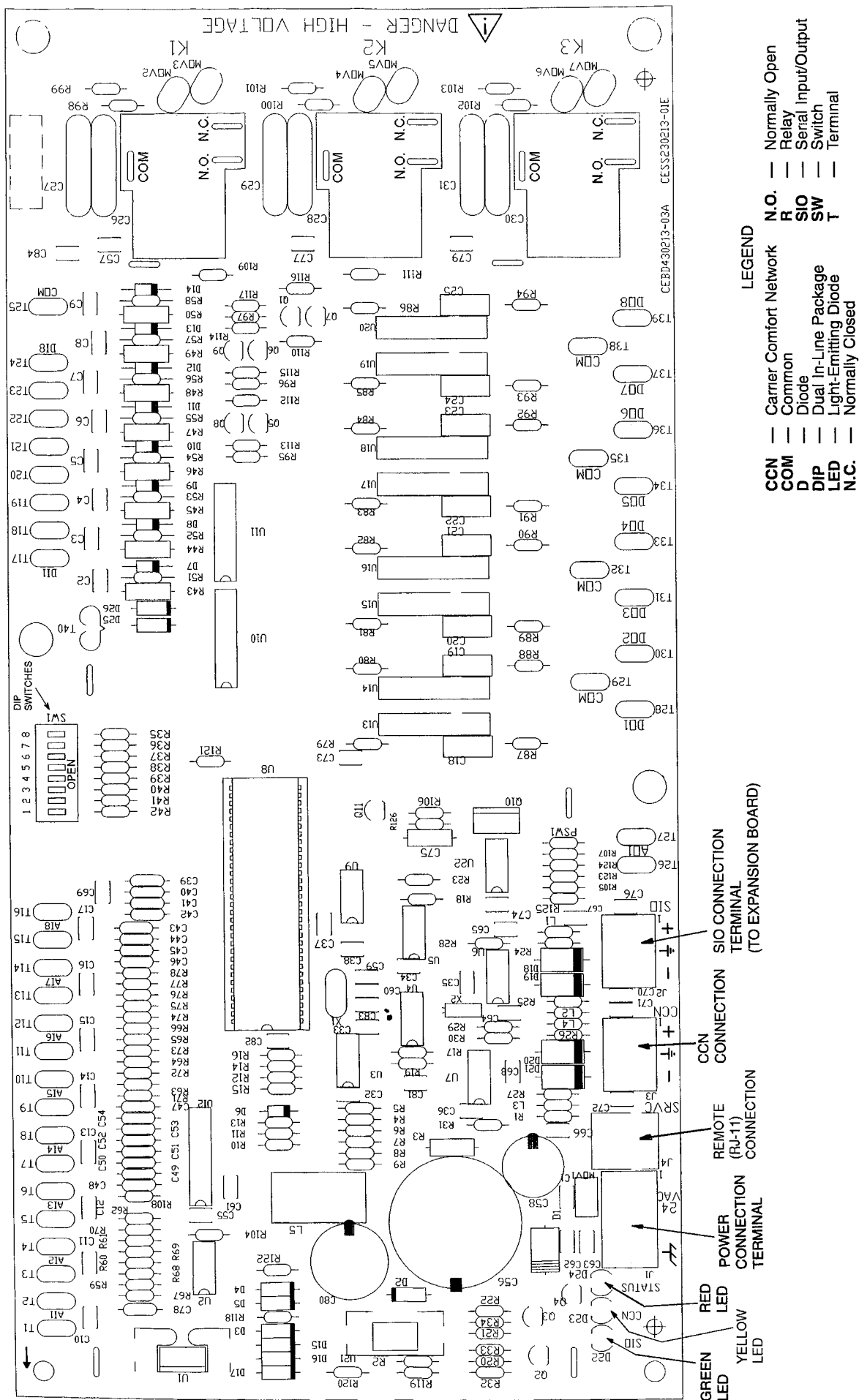
The unit must be electrically grounded in accordance with local codes and NEC ANSI/NFPA 70 (National Fire Protection Association).

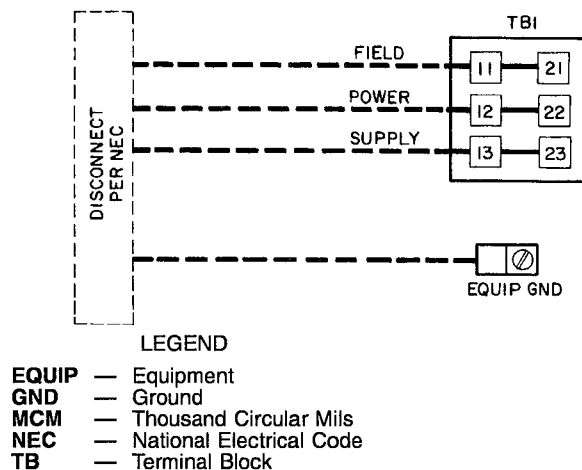
Operating voltage to compressor must be within voltage range indicated on unit nameplate. On 3-phase units, voltages between phases must be balanced within 2% and the current must be balanced within 10%.

Use the formula in Table 4 to determine the percentage of voltage imbalance.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

Unit failure as a result of operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components.





NOTE: Maximum wire size for TB1 is 500 MCM.

Fig. 10 — Field Power Wiring Connections

On 208/230-v units, transformer no. 1 is wired for 230-v. If 208/230-v unit is to be run with 208-v power supply, the transformer must be rewired as follows:

1. Remove cap from red (208-v) wire.
2. Remove cap from spliced orange (230-v) wire. Disconnect orange wire from black unit power wire.
3. Cap orange wire.
4. Splice red wire and black unit power wire. Cap wires.

IMPORTANT: Be certain unused wires are capped. Failure to do so may damage the transformers.

FIELD CONTROL WIRING — Install either a Carrier-approved accessory thermostat or a CCN (Carrier Comfort Network) compatible temperature sensor. A control box diagram is shown in Fig. 11.

Thermostat Wiring — Install a Carrier-approved accessory thermostat assembly (per current price pages) according to the installation instructions included with the accessory or these instructions. Locate thermostat assembly on a solid wall in the conditioned space to sense average temperature.

Route thermostat cable or equivalent single leads of colored wire from subbase terminals to low-voltage connections as shown on unit label wiring diagram and in Fig. 12.

NOTE: For wire runs up to 50 ft, use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum). For 50 to 75 ft, use no. 16 AWG insulated wire (35 C minimum). For over 75 ft, use no. 14 AWG insulated wire (35 C minimum). All wire larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.

Set heat anticipators settings to 0.1 for all voltages. Settings may be changed slightly to provide a greater degree of comfort for a particular installation.

Sensor Wiring — The temperature sensor is wired into the unit control board. See Fig. 13.

The unit is controlled with a T-55 or T-56 zone sensor. Terminal TH on the sensor is connected to T1 of the base module board. Terminal COM on the sensor is connected to T2 on the base module board. If a T-56 set point override sensor is used, the override connection SW on the sensor is connected to T3 on the base module board.

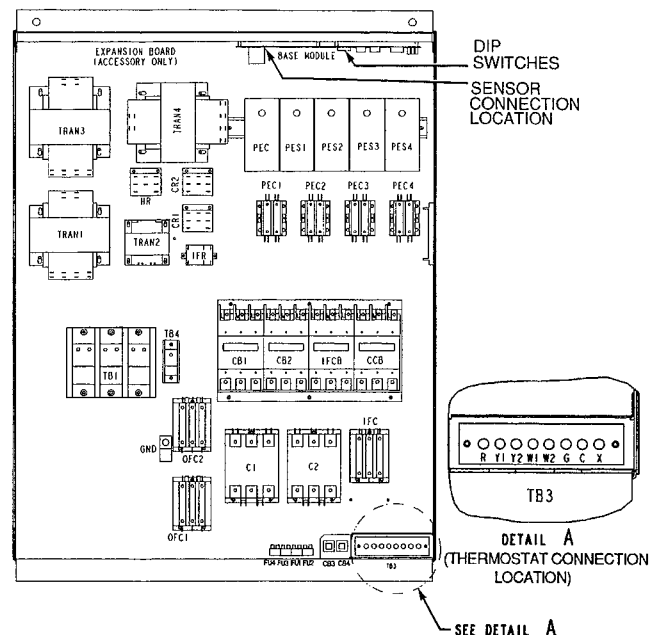


Fig. 11 — Control Box Diagram

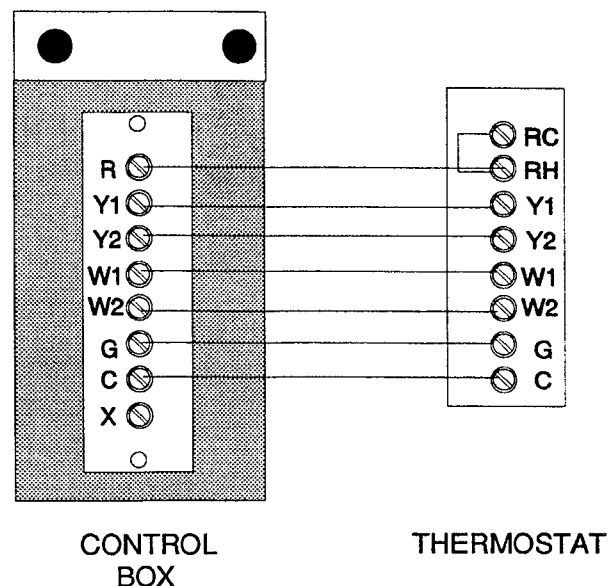


Fig. 12 — Field Control Thermostat Wiring

Table 4 — Electrical Data — 50EJQ,EWQ024,028

UNIT SIZE 50EJQ,EWQ	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSORS		OFM			IFM		POWER EXHAUST		ELECTRIC HEAT*		POWER SUPPLY	
		MIN	MAX	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	kW	FLA	MCA	MOCP†
024	208/230	187	254	35 6	198	2	1	5 3	5	16 7/15 2	—	—	—/—	—/—	107 4/105 9	125/125
											23.6	4.16	—/—	—/—	131.0/129.5	150/150
											—	—	27/36	75 1/86 6	201 2/214 2	225/225
											23.6	4.16	27/36	75 1/86 6	224 8/237.8	225/250
											—	—	54/72	150 1/173 2	257 5/279 1	275/300
											23.6	4.16	54/72	150.1/173.2	281.1/302.7	300/350
									10	30 8/28	—	—	—/—	—/—	121 5/118 7	150/150
											23.6	4.16	—/—	—/—	145.1/142.3	175/175
											—	—	27/36	75 1/86 6	215 3/227 0	225/250
											23.6	4.16	27/36	75 1/86 6	230.7/250.6	250/275
											—	—	54/72	150.1/173 2	271 6/291 9	300/300
											23.6	4.16	54/72	150.1/173.2	295.2/315.5	300/350
									15	46 2/42	—	—	—/—	—/—	136 9/132 7	150/150
											23.6	4.16	—/—	—/—	160.5/156.3	175/175
											—	—	27/36	75 1/86 6	230 7/241 0	250/250
											23.6	4.16	27/36	75 1/86 6	254 3/264 6	275/275
											—	—	54/72	150 1/173 2	287 0/305 9	300/350
											23.6	4.16	54/72	150.1/173.2	310.6/329.5	350/350
	460	414	508	17 8	99	2	1	2 7	5	7 6	—	—	—	—	53 1	70
											23.6	41.6	—	—	65.7	80
											—	—	36	43 3	107 2	110
											23.6	41.6	36	43.3	119 8	125
											—	—	72	86 6	139 7	150
											23.6	41.6	72	86.6	152.3	175
									10	14	—	—	—	—	59 5	70
											23.6	41.6	—	—	72.1	80
											—	—	36	43 3	113 6	125
											23.6	41.6	36	43.3	126.2	150
											—	—	72	86 6	146.1	150
											23.6	41.6	72	86.6	158.7	175
028	208/230	187	254	39 7	228	2	1	5 3	7 5	24 2/22	—	—	—/—	—/—	124 1/121 9	150/150
											23.6	4.16	—/—	—/—	147.7/145.5	175/175
											—	—	27/36	75 1/86 6	217 9/230 2	225/250
											23.6	4.16	27/36	75.1/86.6	241.5/253.8	250/275
											—	—	54/72	150 1/173 2	274 2/295 1	300/300
											23.6	4.16	54/72	150.1/173.2	297.8/318.7	300/350
									10	30 8/28	—	—	—/—	—/—	130 7/127 9	150/150
											23.6	4.16	—/—	—/—	154.3/151 5	175/175
											—	—	27/36	75.1/86 6	224 5/236 2	225/250
											23.6	4.16	27/36	75.1/86.6	239.9/259.8	250/275
											—	—	54/72	150 1/173 2	280.8/301 1	300/350
											23.6	4.16	54/72	150.1/173.2	304.4/324.7	350/350
									15	46 2/42	—	—	—/—	—/—	146 1/141 9	175/175
											23.6	4.16	—/—	—/—	169.7/165.5	200/200
											—	—	27/36	75 1/86 6	239 9/250 2	250/275
											23.6	4.16	27/36	75 1/86 6	263.5/273.8	275/275
											—	—	54/72	150 1/173 2	296 2/315 1	300/350
											23.6	4.16	54/72	150.1/173.2	319.8/338.7	350/350
	460	414	508	19 9	114	2	1	2 7	7 5	11	—	—	—	—	61.2	80
											23.6	41.6	—	—	73.8	90
											—	—	36	43 3	115 3	125
											23.6	41.6	36	43.3	127.9	150
											—	—	72	86 6	147 8	150
											23.6	41.6	72	86.6	160.4	175
									10	14	—	—	—	—	64 2	80
											23.6	41.6	—	—	76.8	90
											—	—	36	43 3	118 3	125
											23.6	41.6	36	43.3	130 9	150
											—	—	72	86 6	150 8	175
											23.6	41.6	72	86.6	163.4	175
									15	21	—	—	—	—	71 2	90
											23.6	41.6	—	—	83.8	100
											—	—	36	43 3	125 3	150
											23.6	41.6	36	43.3	137.9	150
											—	—	72	86 6	157 8	175
											23.6	41.6	72	86.6	170 4	175

See Legend on next page

LEGEND AND NOTES FOR TABLE 4

LEGEND

FLA	— Full Load Amps
HACR	— Heating, Air Conditioning and Refrigeration
IFM	— Indoor (Evaporator) Fan Motor
LRA	— Locked Rotor Amps
MCA	— Minimum Circuit Amps
MOCP	— Maximum Overcurrent Protection
NEC	— National Electrical Code
OFM	— Outdoor (Condenser) Fan Motor
RLA	— Rated Load Amps

*Heater capacity (kW) is based on heater voltage of 208 v, 240 v, and 480 v. If power distribution voltage to unit varies from rated heater voltage, heater kW will vary accordingly.

†Fuse or HACR circuit breaker

NOTES:

1 In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. The Canadian units may be fuse or circuit breaker.

2 Unbalanced 3-Phase Supply Voltage

Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percent of voltage imbalance.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

EXAMPLE: Supply voltage is 460-3-60

$$\begin{aligned} AB &= 452 \text{ v} \\ BC &= 464 \text{ v} \\ AC &= 455 \text{ v} \\ \text{Average Voltage} &= \frac{452 + 464 + 455}{3} \\ &= \frac{1371}{3} \\ &= 457 \end{aligned}$$

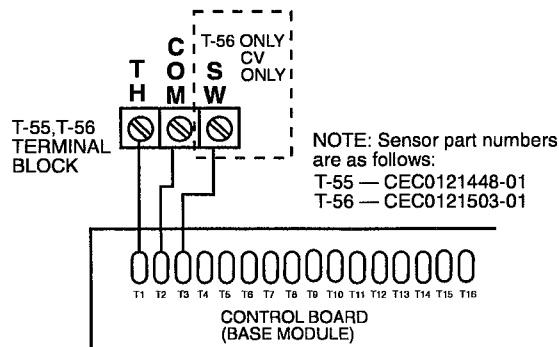
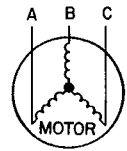


Fig. 13 — Field Control Temperature Sensor Wiring

Remote Field Control — A switch closure across terminals R and W1 on TB-3 will initiate the Occupied mode. This can be done manually as well as through a field-supplied timeclock.

Service Tool, Building Supervisor, and ComfortWorks™ Software — Access to the control board can be achieved through the terminal marked CCN via a 3-wire bus.

IMPORTANT: Default bus address is 0. Default element number is 1. Refer to CCN literature for information on network addressing or changing CCN communication defaults.

Carrier Comfort Network Interface — The 50EJQ,EWQ units can be connected to the CCN. The communication bus wiring is supplied and installed in the field. Wiring consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it, the negative pins must be wired to the negative pins, and the signal pins must be wired to signal ground pins. Wiring connections for CCN should be made at the 3-pin plug (CCN located at the base board). Consult CCN literature for further information.

Determine maximum deviation from average voltage

$$(AB) 457 - 452 = 5 \text{ v}$$

$$(BC) 464 - 457 = 7 \text{ v}$$

$$(AC) 457 - 455 = 2 \text{ v}$$

Maximum deviation is 7 v

Determine percent of voltage imbalance

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{7}{457} \\ &= 1.53\% \end{aligned}$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

3 MCA calculation for units with electric heaters over 50 kW = (1.25 x IFM amps) + (1.00 x heater FLA)



Conductors and drain wire must be 20 AWG minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of -4 F to 140 F is required. Table 5 lists cables that meet the requirements.

Table 5 — CCN Connection Approved Shielded Cables

MANUFACTURER	CABLE PART NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

IMPORTANT: When connecting the CCN communication bus to a system element, use a color coding system for the entire network to simplify installation and checkout. See Table 6.

Table 6 — Color Code Recommendations

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	CCN PLUG PIN NO.
Positive (+)	RED	1
Ground	WHITE	2
Negative (-)	BLACK	3

NOTE: If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of the communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground **at one point only**. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only).

To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground), and black (-) conductors. (If a different network color scheme is used, substitute appropriate colors.)
3. Remove the 3-pin male plug from the base module in the main control box, and connect the wires as follows:
 - a. Insert and secure the red (+) wire to terminal 1 of the 3-pin plug.
 - b. Insert and secure the white (ground) wire to terminal 2 of the 3-pin plug.
 - c. Insert and secure the black (-) wire to terminal 3 of the 3-pin plug.
4. Insert the plug into the existing 3-pin mating connector on the base module in the main control box.

Step 8 — Make Outdoor-Air Inlet Adjustments

ECONOMIZER

NOTE: If accessory power exhaust or barometric relief packages are being added to the unit, install power exhaust or barometric relief before installing economizer hoods.

Economizer Hood Assembly — The economizer hood is shipped in a package secured to the outside of the unit and must be field-assembled. There are 2 hoods on every unit. The 50EWQ units are side supply and side return. The return duct limits access to economizer filters from below. Filter tracks (mounting angle without tabs) must be installed correctly to allow access to economizer filters from each side. Perform the following procedure to assemble the economizer hood.

NOTE: Before assembly of the economizer hood, check along the outer edges of the economizer assembly for any seal strip protruding past the flanges. Trim the excess seal strip so that it is flush with the economizer assembly flanges.

1. Apply black seal strip (provided in package) to outside top-edge of hood sides. Wrap seal strip over edge to cover top flange (4 hood sides). Make sure seal strip covers screw holes. Allow strip to overhang 1/8-in. past the end opposite the mounting flange. See Fig. 14.
2. Assemble hood sides, top, and cross member with gasketed screws provided. See Fig. 15.
3. Attach 10 green speed clips (provided) to hood top.
4. Apply black seal strip (provided) to mounting flanges of hood sides being sure to cover mounting holes. See Fig. 16.

NOTE: Each hood assembly has a slotted side that should be adjacent to the other hood when mounted to the unit.

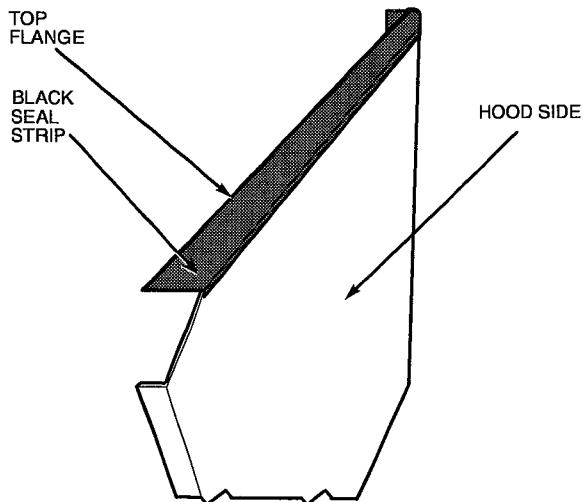
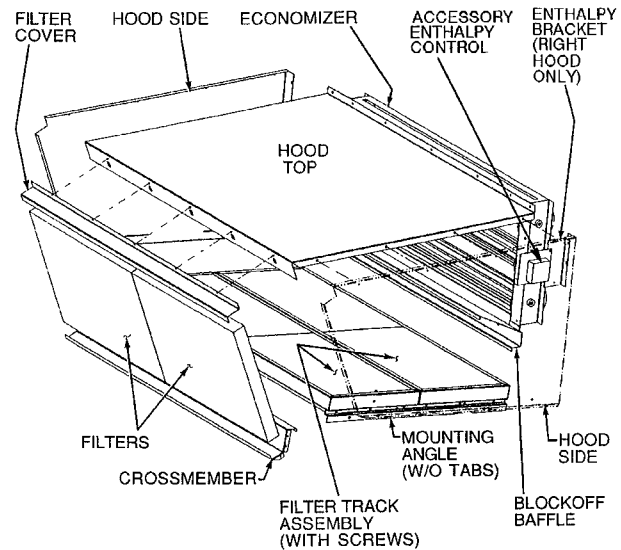


Fig. 14 — Adding Seal Strip to Top of Hood Sides



NOTE: Left-side economizer hood has mounting angle without tabs and filter track assembled end on the opposite side

Fig. 15 — Economizer Hood Assembly (Right-Side Economizer Hood Shown)

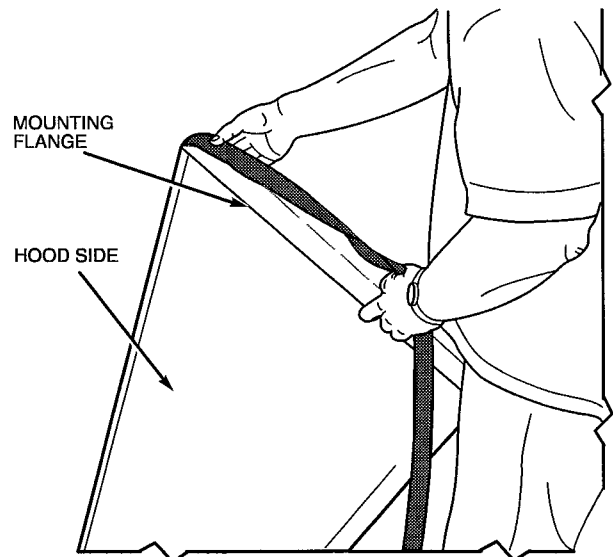


Fig. 16 — Adding Seal Strip to Mounting Flange of Hood Sides

5. Apply black seal strip (provided) to hood top mounting flange. Seal strip of hood top mounting flange must press tightly against seal strip of hood side mounting flanges. See Fig. 17.
6. Add gray foam strip (provided in package) to cross members on bottom tray. See Fig. 18.
7. Place gray foam strip (provided) on inside of slotted hood side between filter and cross member opposite the mounting end. See Fig. 19.
8. Attach gray foam strip (provided) to block-off baffle on outer face of flange. See Fig. 20.
9. Remove the screws on each end and along top of damper assembly of unit. Remove top 2 screws on each side of filter panel under damper assembly. Set hood assembly in place and attach to unit using these screws.

10. Attach accessory enthalpy bracket on hood side furthest from control box end. Locate bracket on inside upper right-hand corner of economizer hood using hood mounting holes. Mount outdoor-air thermistor to enthalpy bracket (if purchased). Attach and wire enthalpy assembly. Place quick connects on enthalpy wires.
11. Remove screws along bottom of damper assembly. Locate and mount blockoff baffle using these screws.
12. Assemble 2 filter tracks side-by-side with the assembled ends together.
13. Attach mounting angle (without tabs) to the assembled end of the filter track. See Fig. 21.
14. Attach 6 green speed clips (provided) to mounting angles. Engagement section of clip faces inside of rack.
15. Attach remaining mounting angle (with tabs) to other end of the filter track with no. 10 screws provided. See Fig. 22.
16. Place filter track assembly in bottom of hood by placing tabbed end into slotted side (with tab on bottom) and attaching opposite end to hood with speed clips and gasketed screws provided. Tabs can be hand bent after they have been inserted into the side.
NOTE: The filter track assembly end with screws should face away from the other hood when mounted on the unit.
NOTE: Tabs from both filter tracks will be in the same space. After one filter track has been inserted into board, bend the tabs so they will not interfere with installation of the second hood.
17. Attach black seal strip (provided) to filter cover. Seal strip should be applied to the center of the large flange making sure to cover holes. See Fig. 23.
18. Slide two 20 x 25-in. filters into cross members of hood assembly. Attach filter cover over filters with screws and speed clips provided.

Minimum Damper Position Setting — Setting of the outdoor air damper position is performed in conjunction with a shortened version of the field-run test. This is performed by first opening DIP (Dual In-Line Package) switch no. 4 then no. 6. See Fig. 9 and Direct Digital Controls DIP Switch Configuration on page 20.

The outdoor-air damper closes. The control allows 90 seconds for the damper to close in case it is in the full open position. Next, the indoor-fan contactor will energize. The outdoor-air damper will remain at 0% for 30 seconds. It will then move to the 10% position for another 30 seconds. This will be repeated at every 10% increment for 30 seconds until the damper reaches 100% open. Close DIP switch no. 6 during the 30 seconds immediately after the desired outdoor air minimum damper position. The 30-second time period is to allow time where DIP switch no. 4 can be closed. The default value of the minimum outdoor air damper position is 20%. If the desired minimum position is 30%, allow the damper position to go to 10% for 30 seconds, then 20% for 30 seconds, and when it reaches 30% close DIP switch no. 4 during the 30-second period following the 30% position. Close DIP switch no. 6 to complete the test.

The minimum outdoor air damper position is now set.

ECONOMIZER SETTINGS

Accessory Enthalpy Control (Fig. 24) — The control (HH57AC077) is mounted in the economizer hood. See Fig. 15. The enthalpy setting adjustment is on the enthalpy control. For maximum benefit of outdoor air, set enthalpy control to A. See Fig. 25 and 26.

Accessory Differential Enthalpy Control — The control (HH57AC077), in conjunction with the accessory enthalpy sensor (HH57AC078), controls economizer operation according to the differential enthalpy. The control is mounted in the economizer hood. The sensor is mounted in the return duct (50EJQ) or return air plenum (50EWQ).

Step 9 — Position Power Exhaust/Barometric Relief Damper Hood

— All electrical connections have been made and adjusted at the factory. The power exhaust blowers and barometric relief dampers are shipped assembled and tilted back into the unit for shipping. Brackets and extra screws are shipped in shrink wrap around the dampers. If ordered, each unit will have 4 power exhaust blowers and motors or 4 barometric relief dampers.

1. Remove 9 screws holding each damper assembly in place. See Fig. 27. Each damper assembly is secured with 3 screws on each side and 3 screws along the bottom. Save screws.
2. Pivot each damper assembly outward until edges of damper assembly rest against inside wall of unit.

⚠ CAUTION

Be careful when tilting blower assembly. Hoods and blowers are heavy and can cause injury if dropped.

3. Secure each damper assembly to unit with 6 screws — across top (3 screws provided) and bottom (3 screws from Step 1) of damper.
4. With screws saved from Step 1, install brackets on each side of damper assembly.
5. Remove tape from damper blades.

Step 10 — Install Accessories — After all the factory-installed options have been adjusted, install all field-installed accessories. Refer to the accessory installation instructions included with each accessory.

MOTORMASTER® III SENSOR LOCATION — Motormaster III sensor locations are shown in Fig. 28. Refer to the Motormaster III installation instructions for installation information. See Fig. 29 and 30 for wiring information.

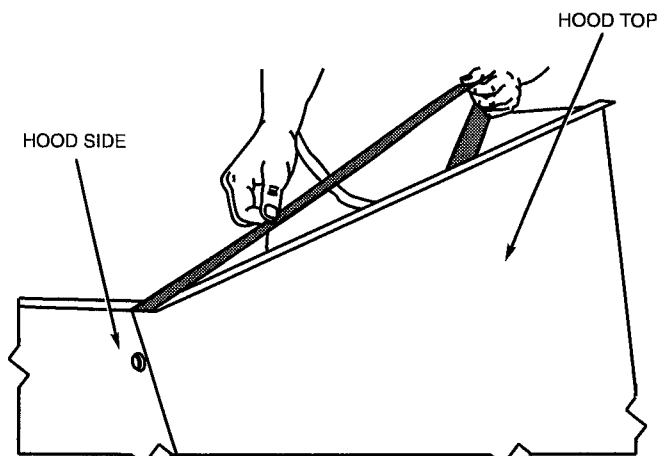


Fig. 17 — Adding Seal Strip to Hood Top Mounting Flange

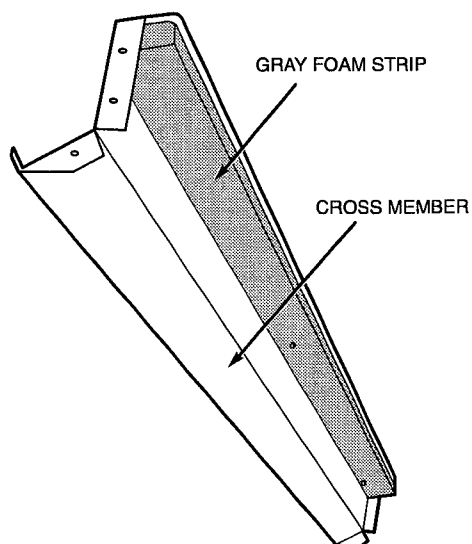


Fig. 18 — Adding Foam Strip to Cross Member

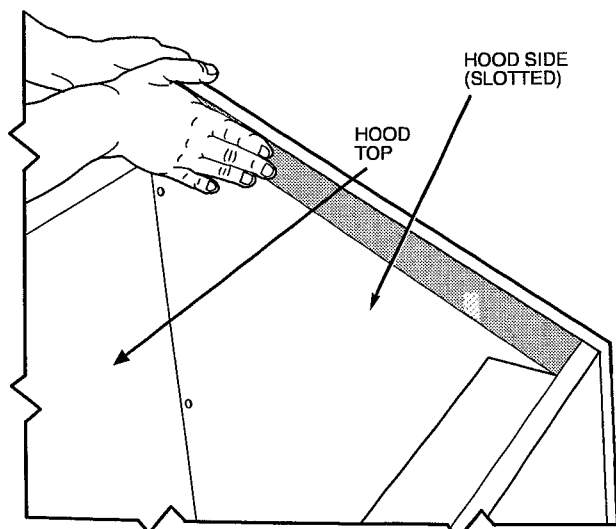


Fig. 19 — Adding Foam Strip to Hood Side

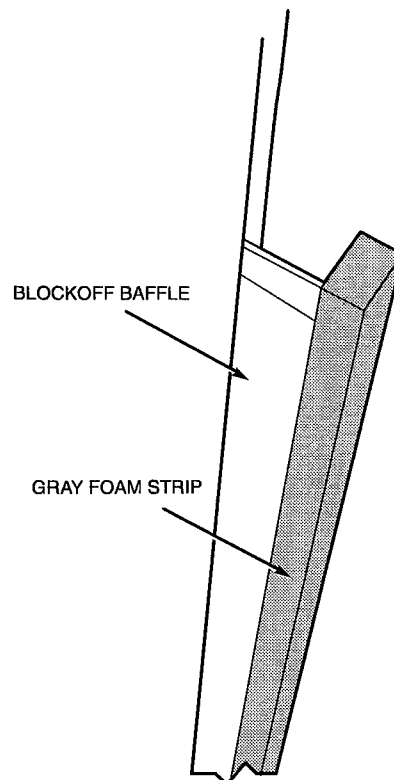


Fig. 20 — Adding Foam Strip to Blockoff Baffle

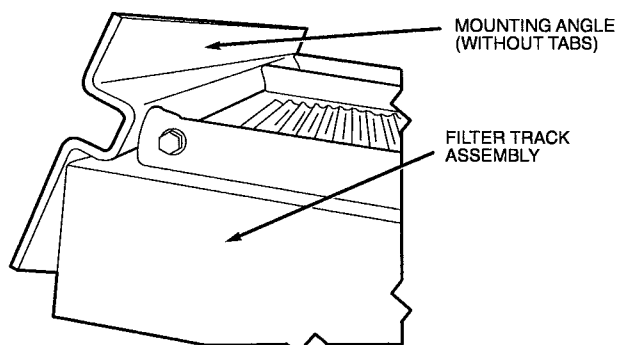


Fig. 21 — Mounting Angle (Without Tabs) Attached to Filter Track Assembly

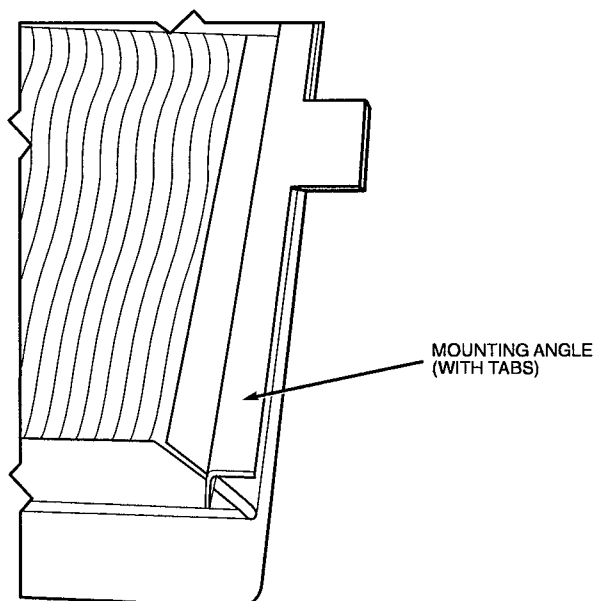


Fig. 22 — Mounting Angle (With Tabs) Attached to Filter Track Assembly

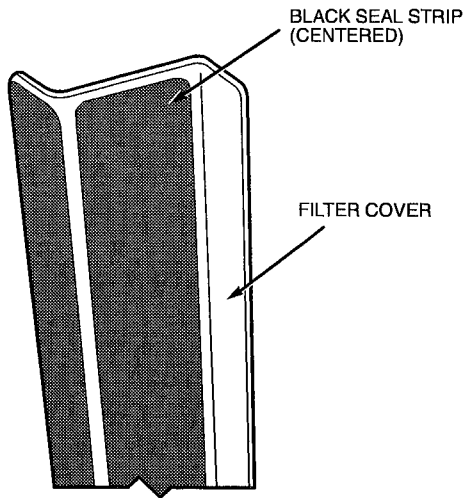
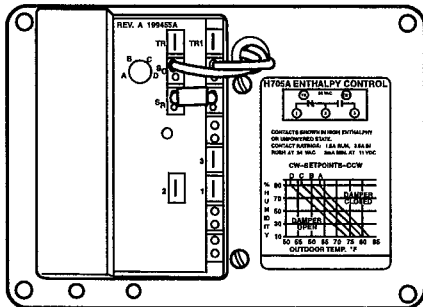
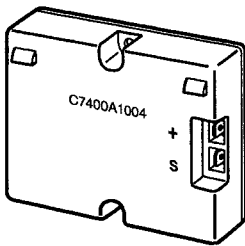


Fig. 23 — Attaching Seal Strip to Filter Cover



**HH57AC077
ENTHALPY CONTROL**



**HH57AC078
ENTHALPY SENSOR
(USED WITH ENTHALPY
CONTROL FOR DIFFERENTIAL
ENTHALPY OPERATION)**

Fig. 24 — Differential Enthalpy Control and Sensor

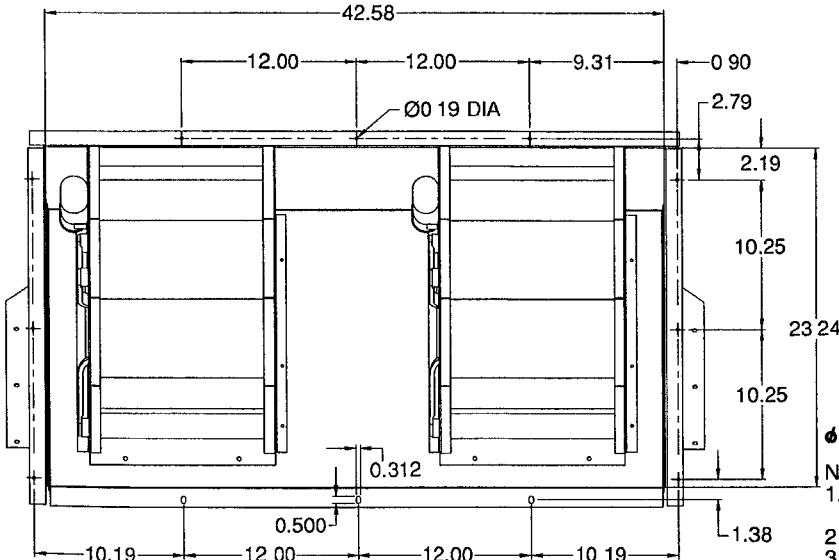
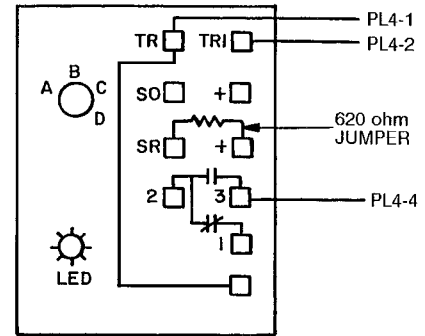
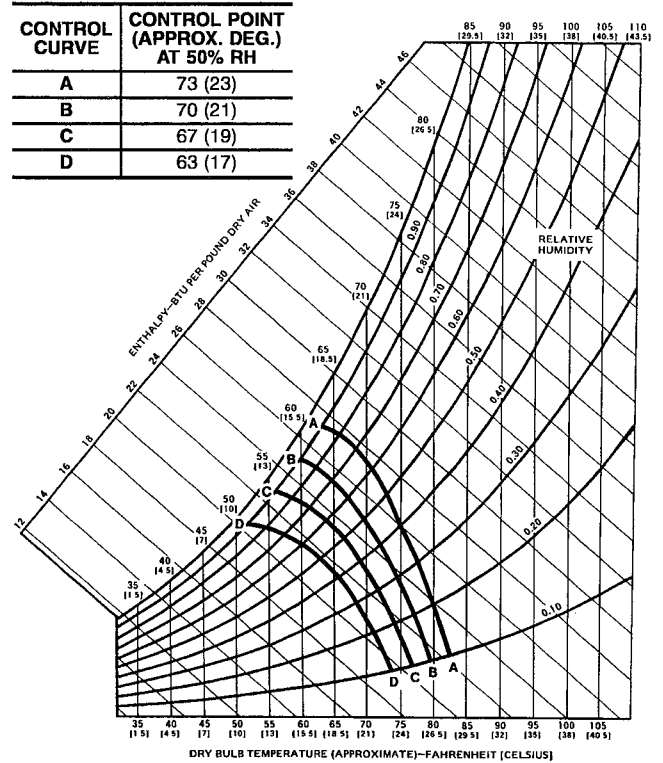


Fig. 27 — Barometric Relief Damper and Power Exhaust Mounting Details



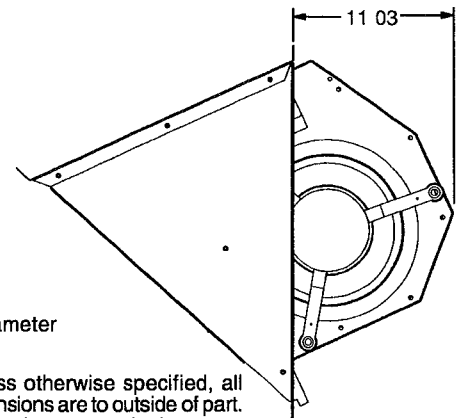
NOTE: Switches shown in high enthalpy state. Terminals 2 and 3 close on enthalpy decrease.

Fig. 25 — Wire Connections for Solid-State Enthalpy Control (HH57AC077)



RH — Relative Humidity

Fig. 26 — Psychrometric Chart for Enthalpy Control



NOTES:

1. Unless otherwise specified, all dimensions are to outside of part.
2. Dimensions are in inches.
3. Two assemblies per unit.

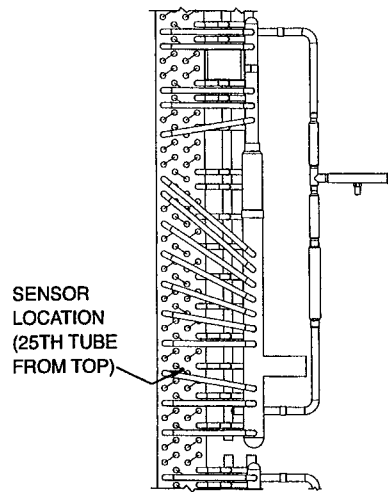


Fig. 28 — Motormaster® III Sensor Location (Sizes 024,028)

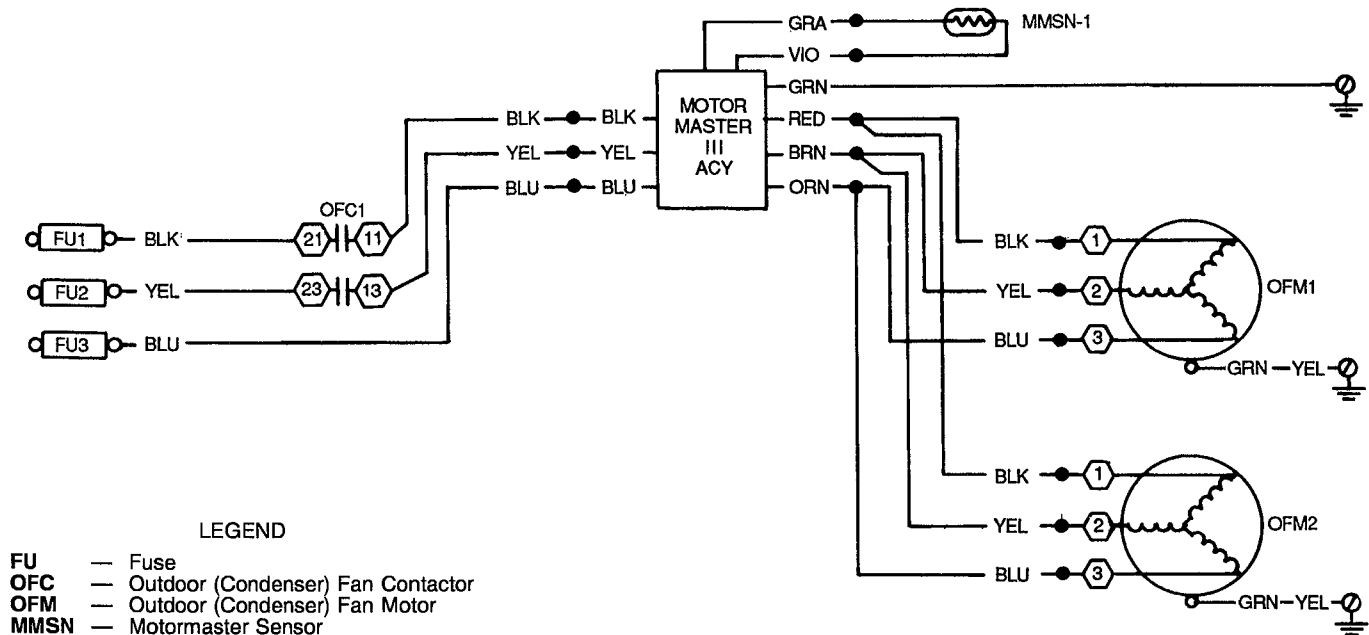


Fig. 29 — Motormaster III Device Wiring — 208/230-3-60 Units

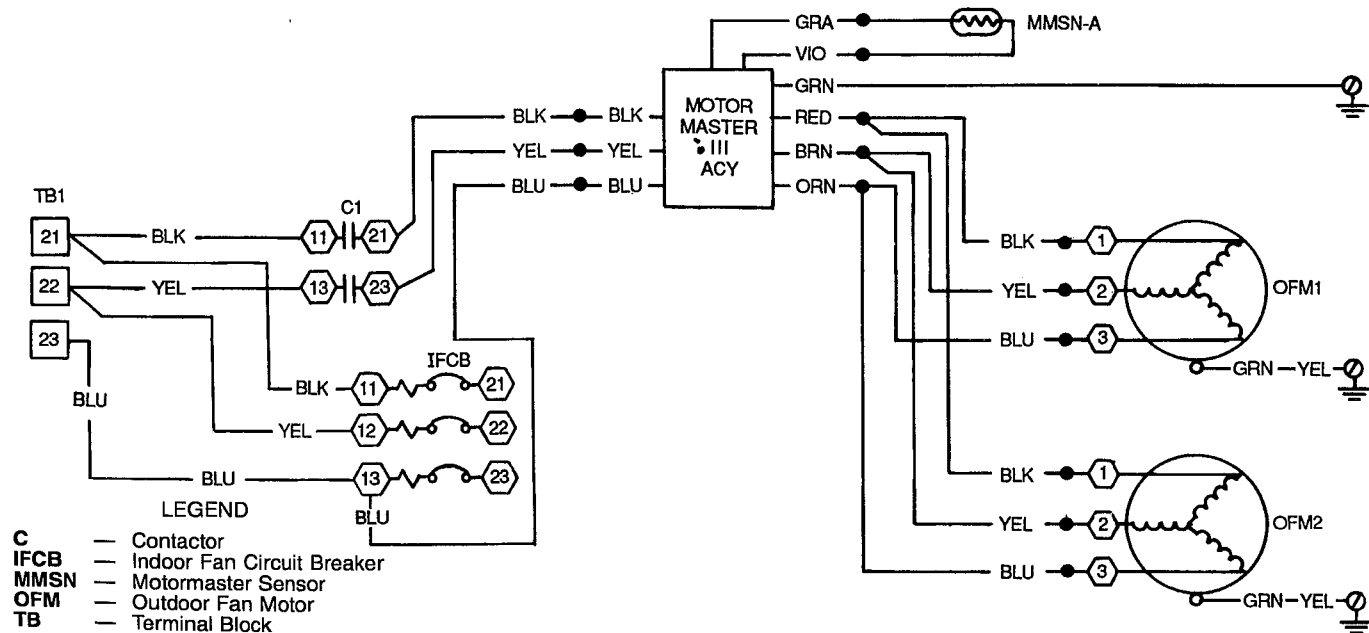


Fig. 30 — Motormaster III Device Wiring — 460-3-60 Units

START-UP

Use the following information and Start-Up Checklist on page CL-1 to check out unit PRIOR to start-up.

Unit Preparation — Check that unit has been installed in accordance with these installation instructions and applicable codes.

Compressor Mounting — Loosen the compressor hold-down bolts until sidewise movement of the washer under each holddown bolt head can be obtained. Do not loosen completely as bolts are self-locking and will maintain adjustment.

Service Valves — Ensure that the suction and discharge service valves are open. Damage to the compressor could result if they are left closed.

Internal Wiring — Check all electrical connections in unit control boxes; tighten as required.

Refrigerant Service Ports — Each refrigerant system has one suction port located in the top of the compressor motor casing. All units also have one service port on the liquid line valve and one on the compressor discharge valve. Be sure that caps on the ports are tight.

Power Exhaust — The optional non-modulating power exhaust is a two-stage design where the operation of the exhaust fans is linked to economizer position. When the supply fan is running and the economizer is 25% open, the base module closes contacts, activating 2 exhaust fans. When the economizer position reaches 75% open, the base module activates the other 2 exhaust fans. The fans will turn off when the economizer closes below the same points. The economizer position set points that trigger the exhaust fans can be modified, but only through use of the Service Tool, ComfortWorks™, or Building Supervisor software. If single-stage operation is desired, adjust the economizer set points to identical values at the desired point to activate all exhaust fans.

The optional modulating power exhaust is controlled by a modular electronic sequencer system. This system consists of a model R353 signal input module and 4 model S353 staging modules. The signal input module receives a 0 to 10 vdc signal from the building pressure transducer, which is mounted adjacent to the supply static transducer behind the filter access panel. The modules are mounted just below the unit control board. The left module is the R353, and the 4 modules on the right are S353 modules for stages 1 through 4. On the unit wiring label, the R353 is designated PEC, and the S353 modules are designated PES1 through PES4.

The building pressure transducer range is -0.5 to +0.5 in. wg. It is powered by a 0 to 10 vdc signal. A factory-installed hose at the "Lo" connection leads to atmosphere, and a field-supplied hose must be connected to the "Hi" connection and led into the building to a point where building pressure is to be controlled. There is a plug button in the bulkhead just above the transducers, for use in leading the hoses into the building via the return air ductwork.

NOTE: With "Lo" connection to atmosphere and "Hi" connection to building, the unit will attempt to maintain a positive building pressure. To maintain a negative building pressure, connect "Lo" to building and "Hi" to the atmosphere.

There are 3 adjustments at the R353 module, all of which have been factory set. In the center of the circuit board is a set of 4 pins with a jumper, labeled J2. This determines the mode of operation. The bottom 2 pins must be jumpered for direct operation. Direct operation means that the staging modules are activated in sequence as the input signal increases.

At the upper right corner of the board is a set of 5 pins and jumper, which determines the time constant for the control. The time constant is the delay in response built into the controls. The jumper should be on the middle or bottom 2 pins, for the maximum time constant. The delay can be decreased, if desired, by moving the jumper progressively upward, always jumpering adjacent pins.

At the lower left corner of the board below the terminal strip is a resistor marked R27. This must be removed in order to obtain the 0 to 10 vdc signal output. There will not be a resistor on a factory-supplied module, but a resistor may be present on a replacement module and must be removed.

The R353 module has a terminal block with 7 connections available for wiring. The 2 right-hand terminals are for the 24 vac and common connections. The next 2 terminals are for the 0 to 10 vdc signal. Consult the wiring label for wire identification if replacing the module. The 3 left-hand terminals are not used for this application.

The S353 module has an LED (light-emitting diode), a set of 4 jumper pins, and 2 potentiometers. The LED will light whenever the module is activated, providing a visual indication of the number of exhaust fans running. The jumper pins are arranged in a square format. Two jumpers are used to determine the mode of operation (direct or reverse). The 2 jumpers must be arranged horizontally for direct action (factory set).

At the top of the module are 2 potentiometers. The left potentiometer adjusts the **offset**. The right potentiometer adjusts **differential**. The potentiometers are factory set for a nominal 0 in. wg building pressure.

The **offset** set point is defined as the point at which a module turns off a fan, and is measured in terms of percent of the input signal. For control purposes, 0 offset is at an arbitrary "floor" which is established at 10% of the input signal, or 1 vdc. In this example, the first stage will turn off at 30% (3 vdc), and the offset potentiometer will be set at 20%. The second stage will turn off at 50% signal (5 vdc), and the offset potentiometer will be set at 40%. The fourth stage is at the maximum 75% offset, which equates to 85% signal or 8.5 vdc. The offset potentiometer is calibrated in 10% increments.

Table 7 relates building pressure to signal level.

Table 7 — Potentiometer Signal Levels

BUILDING PRESSURE (in. wg)	SIGNAL LEVEL (vdc)
-0.50	2
-0.25	4
0 00	6
0.25	8
0 50	10

If the building pressure is controlled at 0 in. wg, offset of the first stage should be set at 50%, which equates to 60% of the input signal, or 6 vdc. The other stages can then be set as desired between 50% and 75%.

The default offset set points for modulating power exhaust are shown in Table 8.

Table 8 — Power Exhaust Default Set Points

STAGE	OFFSET	DIFFERENTIAL	OFF VOLTAGE	ON VOLTAGE	OFF STATIC PRESSURE (in. wg)
1	50%	3%	6.0	6.3	0.00
2	55%	3%	6.5	6.8	0.06
3	60%	3%	7.0	7.3	0.12
4	64%	3%	7.4	7.7	0.18

The **differential** set point is the difference between the turn off point and the turn on point for each module. It also is calibrated in terms of percent of input signal, and has a range of 1% to 7%. The differential potentiometer is calibrated in 1% increments, and is factory set at approximately 3%. It is recommended to leave the set point at 3%, to minimize cycling of the fans.

The offset and differential potentiometers have been factory set for atmospheric pressure. Do not change these settings until there is some experience with the building. In most cases the factory settings will be satisfactory. However, if the building pressure is not being maintained as desired, then some minor adjusting on a trial and error basis can be made.

Direct Digital Controls DIP Switch Configuration

The Direct Digital Control (DDC) board must be configured for each application. The DDC board is configured through the DIP switches located on the board. There are 8 DIP switches which configure 8 different applications of the DDC. See Table 9. DIP switch 1 is on the left of the block. DIP switch 8 is on the right of the block. To open a DIP switch, push the switch toward the side marked "OPEN" on the rocker switch with a suitable tool (small-blade screwdriver). To close a DIP switch, push the switch away from the side marked "OPEN" on the rocker switch. Factory settings are shown in Table 10.

The DIP switch configurations of the unit control software are as follows:

- Set DIP switch 1 to closed to configure the unit to operate as a CV (constant volume) unit
- DIP switch 2 configures the unit to use a space sensor or a thermostat
- DIP switch 3 configures the DDC for use with an electronic expansion board
- DIP switch 4 is used to field test the unit
- DIP switch 5 is used to specify the type of power exhaust
- DIP switch 6 configures the Time Guard® override and, when used with the field test function, sets the minimum damper position
- Set DIP switch 7 to closed to configure the unit indoor fan for use with electric heat
- Set DIP switch 8 to open to configure the unit for heat pump operation

Table 9 — DIP Switch Configuration

SETTING	1	2	3	4	5	6	7	8
OPEN	—	CCN or Sensors Used	Expansion Board	Field Test ON	Modulated Power Exhaust	Time Guard® Override ON	Gas Heat	Heat Pump Operation
						IN CONJUNCTION WITH FIELD TEST — Set Minimum Damper Position		
CLOSED	CV	Thermostat	Base Control Board Only	Field Test OFF	Constant Volume Power Exhaust	Time Guard Override OFF	Electric Heat	Air Conditioner Operation

LEGEND

CCN — Carrier Comfort Network
CV — Constant Volume

NOTES:

- 1 The OPEN side of the DIP switch is marked "OPEN." When the rocker switch is on the "OPEN" side of the switch, the switch is OPEN
- 2 DIP switch no. 7 is used for indoor fan control during heat operation. It should be set to closed.
- 3 When the unit is field-tested (DIP switch 4 to OPEN), the function of DIP switch 6 changes and it is used to set the minimum damper position.

Table 10 — DIP Switch Factory Settings

UNIT	1	2	3	4	5	6	7	8
50EJQ/EWQ	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open

Crankcase Heater(s) — Heater(s) is energized as long as there is power to the unit, except when the compressors are operating.

IMPORTANT: Unit power must be on for 24 hours prior to start-up. Otherwise, damage to compressor may result.

Indoor Fan — Fan belt and fixed pulleys are factory-installed. See Table 11 for Fan Performance Data. See Table 12 for Motor Limitation data. Be sure that fans rotate in the proper direction. Static pressure drop for power exhaust, barometric relief damper, and electric heat is negligible. To alter fan performance, see Indoor Fan Performance Adjustment section on page 26.

Outdoor Fans and Motors — Fans and motors are factory set. Refer to Outdoor-Fan Adjustment section (page 27) as required.

Return-Air Filters — Check that correct filters are installed in filter tracks. See Table 1. Do not operate unit without return-air filters.

Filter Replacement — To replace filters, open filter access door (marked with label). Remove inner access panel. Remove plastic filter retainer in between filter tracks by sliding and pulling outward. Remove first filter by sliding it out of the opening in filter track. Locate filter removal tool, which is shipped next to the return air dampers. Use the filter removal tool to remove the remaining filters.

Outdoor-Air Inlet Screens — Outdoor-air inlet screens must be in place before operating unit.

Economizer Adjustment — Remove filter access panel. Check that outdoor-air damper is closed and return-air damper is open.

Economizer operation and adjustment is described in Sequence of Operation and Make Outdoor Air Inlet Adjustments sections (this page and page 14), respectively.

Sequence of Operation

NOTE: Unit is shipped with default values that can be changed through Service Tool or CCN software.

COOLING — On power up, the control module will activate the initialization software. The initialization software reads DIP switch no. 1 position to determine CV operation. Next, DIP switch no. 2 is read to determine if the control is TSTAT or sensor type operation. The initialization sequence: clears all alarms and alerts; re-maps the input/output database for CV operation; sets maximum heat stages to 2; and sets maximum cool stages to 3. The control module reads DIP switch no. 3 and determines if the unit will use expansion mode operation.

The TSTAT function performs a thermostat based control by monitoring Y1, Y2, W1, W2 and G inputs. These functions control stages: cool1, cool2, heat1, heat2, and the indoor fan respectively. If the TSTAT function is not selected, the control module determines the occupancy state based on the system time schedules or with remote occupied/unoccupied input. If Temperature Compensated Start is active, the unit will be controlled as in the Occupied mode. User defined set points are shown in Table 13.

Occupied or unoccupied comfort set points must be selected. Use of the space temperature offset input can also be configured. The control module will set appropriate operating mode and fan control. The control module will turn on indoor fan if in Occupied mode or if the unit is in Unoccupied mode and the space temperature is outside of the unoccupied comfort set points (Unoccupied Heat or Unoccupied Cool). The control module will then monitor space temperature against comfort set points and control heating or cooling stages as required. If the system is in the Occupied mode, the economizer will operate as required. If the system is in Unoccupied mode, the system will perform night-time free cool and IAQ (indoor air quality) pre-occupancy purge as required (when functions are enabled via software). Whenever the DX (direct expansion) cooling is requested, the outdoor fan will operate.

Table 11 — Fan Performance, 50EJQ024,028 — Vertical Discharge Units
 FOR 50EWQ UNITS, REDUCE NET AVAILABLE EXTERNAL STATIC PRESSURE BY 0.3 IN. WG

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
4,000	322	0.77	401	1.09	466	1.43	523	1.78	575	2.13	622	2.50	666	2.87	707	3.25
5,000	361	1.14	433	1.50	494	1.86	548	2.23	598	2.62	643	3.00	686	3.40	726	3.80
6,000	403	1.62	468	2.01	526	2.41	577	2.81	624	3.21	668	3.62	709	4.04	748	4.46
7,000	448	2.22	508	2.65	561	3.08	609	3.50	654	3.93	696	4.37	736	4.81	773	5.25
8,000	495	2.97	549	3.42	599	3.88	645	4.33	687	4.79	727	5.25	765	5.71	801	6.18
8,250	507	3.18	560	3.64	609	4.10	654	4.56	696	5.02	735	5.49	773	5.96	809	6.43
9,000	543	3.85	593	4.34	639	4.82	682	5.30	723	5.78	761	6.27	797	6.76	832	7.24
10,000	592	4.90	638	5.41	682	5.91	722	6.42	760	6.93	797	7.44	832	7.95	865	8.46
11,000	642	6.10	685	6.64	725	7.17	764	7.70	800	8.24	835	8.77	868	9.30	900	9.84
12,000	693	7.48	733	8.04	771	8.60	807	9.15	841	9.71	874	10.26	906	10.82	937	11.38
12,500	718	8.23	757	8.80	794	9.37	829	9.94	862	10.51	895	11.08	926	11.64	956	12.21
13,000	744	9.03	781	9.62	817	10.20	851	10.78	884	11.36	915	11.93	946	12.51	975	13.09
13,750	783	10.32	818	10.92	852	11.52	885	12.12	917	12.71	947	13.31	977	13.90	1005	14.50
14,000	795	10.77	831	11.38	864	11.98	896	12.59	928	13.19	958	13.79	987	14.39	1015	14.99
15,000	847	12.71	880	13.34	912	13.96	943	14.59	972	15.21	1001	15.83	1029	16.45	1056	17.08

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
4,000	746	3.64	783	4.03	818	4.44	852	4.85	884	5.26	916	5.68	946	6.11	975	6.54
5,000	764	4.21	800	4.62	834	5.04	868	5.46	900	5.89	930	6.33	960	6.77	989	7.22
6,000	785	4.89	820	5.32	854	5.76	886	6.21	918	6.65	948	7.11	977	7.56	1006	8.02
7,000	809	5.70	843	6.16	876	6.61	908	7.08	939	7.54	968	8.01	997	8.49	1025	8.96
8,000	836	6.65	869	7.12	901	7.60	932	8.08	962	8.57	991	9.05	1019	9.55	1046	10.04
8,250	843	6.91	876	7.39	908	7.87	938	8.36	968	8.84	997	9.34	1025	9.83	1052	10.33
9,000	865	7.74	898	8.23	929	8.73	959	9.23	988	9.74	1016	10.24	1043	10.75	1070	11.27
10,000	897	8.98	928	9.49	958	10.01	987	10.53	1016	11.06	1043	11.58	1070	12.11	1096	12.64
11,000	931	10.37	961	10.91	990	11.45	1018	11.99	1046	12.54	1073	13.08	1099	13.63	1124	14.18
12,000	967	11.94	996	12.49	1024	13.06	1051	13.62	1078	14.18	1104	14.75	1129	15.31	1154	15.88
12,500	985	12.78	1014	13.35	1041	13.92	1068	14.49	1094	15.07	1120	15.64	1145	16.22	1169	16.80
13,000	1004	13.67	1032	14.25	1059	14.83	1086	15.42	1111	16.00	1137	16.59	1161	17.17	1185	17.76
13,750	1033	15.09	1060	15.69	1087	16.29	1112	16.88	1138	17.48	1162	18.08	1186	18.68	—	—
14,000	1043	15.59	1070	16.19	1096	16.79	1122	17.40	1147	18.00	1171	18.60	1195	19.21	—	—
15,000	1083	17.70	1109	18.32	1134	18.94	1159	19.56	1183	20.19	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)					
	3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
4,000	1004	6.97	1032	7.41	1059	7.86
5,000	1017	7.67	1045	8.12	1072	8.58
6,000	1034	8.49	1061	8.96	1087	9.43
7,000	1052	9.44	1079	9.93	1105	10.42
8,000	1073	10.54	1099	11.04	1125	11.55
8,250	1079	10.84	1105	11.34	1130	11.85
9,000	1096	11.78	1122	12.30	1147	12.82
10,000	1122	13.18	1147	13.71	1171	14.25
11,000	1149	14.73	1173	15.29	1197	15.84
12,000	1178	16.45	1202	17.03	—	—
12,500	1193	17.38	—	—	—	—
13,000	—	—	—	—	—	—
13,750	—	—	—	—	—	—
14,000	—	—	—	—	—	—
15,000	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
 Field-supplied motor required

NOTES:

- Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters
- Conversion — Bhp to watts:

$$\text{Watts} = \frac{\text{Bhp} \times 746}{\text{Motor efficiency}}$$

Table 12 — Motor Limitations

STANDARD EFFICIENCY MOTORS						
Nominal Hp	Maximum Bhp	Maximum Amps			Maximum Watts	Motor Efficiency
		208	230	460		
5	5.9	17.94	16.99	—	5,348	82.3
	5.9	—	—	8.50	5,240	84.0
7.5	8.7	25.52	24.36	—	7,717	84.1
	9.5	—	—	13.30	8,549	82.9
10	10.2	26.93	25.50	—	8,879	85.7
	11.8	—	—	14.75	10,284	85.6
15	15.3	42.84	40.80	—	13,686	83.4
	18.0	—	—	24.00	15,891	84.5

HIGH EFFICIENCY MOTORS						
Nominal Hp	Maximum Bhp	Maximum Amps			Maximum Watts	Motor Efficiency
		208	230	460		
5	5.9	16.76	13.92	—	5,030	87.5
	5.9	—	—	6.96	5,030	87.5
7.5	8.7	26.10	22.27	—	7,334	88.5
	9.5	—	—	12.16	8,008	88.5
10	10.2	28.56	24.89	—	8,502	89.5
	11.8	—	—	14.40	9,836	89.5
15	15.3	45.08	39.17	—	12,543	91.0
	18.0	—	—	23.04	14,756	91.0

LEGEND

Bhp — Brake Horsepower

NOTE: Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using your fan motors up to the horsepower ratings shown on the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

Table 13 — User Defined Set Points

SET POINT	FORMAT	DESCRIPTION	LIMITS	DEFAULT
OHSP	xx.xF	Occupied Heat Set Point	55 to 80 F	68 F
OCSP	xx.xF	Occupied Cool Set Point	55 to 80 F	78 F
UHSP	xx.xF	Unoccupied Heat Set Point	40 to 80 F	55 F
UCSP	xx.xF	Unoccupied Cool Set Point	75 to 95 F	90 F
SASP	xx.xF	Supply Air Set Point	45 to 70 F	55 F
OATL	xx.xF	Hi OAT Lockout Temperature	55 to 75 F	65 F
NTLO	xx.xF	Unoccupied OAT Lockout Temperature	40 to 70 F	50 F
RTIO	xx.x	Reset Ratio	0 to 10	N/A
LIMIT	xx.x°F	Reset Limit	0 to 20 F	N/A
MDP	xxx%	Minimum Damper Position	0 to 100%	N/A
IAQS	xxxx	IAQ Set Point	1 to 5000 ppm	650 ppm
UHDB	xx.x°F	Unoccupied Heating Deadband	0 to 10 F	1 F
UCDB	xx.x°F	Unoccupied Cooling Deadband	0 to 10 F	1 F
LTMP	xx.xF	Low Temp. Min. Position	0 to 100 F	10 F
HTMP	xx.xF	High Temp. Min. Position	0 to 100 F	35 F
PES1	xx.xF	CV Power Exhaust Stage 1 Point	0 to 100 F	25 F
PES2	xx.xF	CV Power Exhaust Stage 2 Point	0 to 100 F	75 F
DEFRTIME	xxmin	Defrost Cycle Time	30 to 90 minutes	50 minutes

LEGEND

CV — Constant Volume
 IAQ — Indoor Air Quality
 N/A — Not Available
 OAT — Outdoor Air Temperature

NOTE: Computer access may be required to change set points.

The control module will operate economizer, run diagnostics to monitor alarms/alerts at all times, and respond to CCN communications to perform any configured network POC (product outboard control) functions such as time/outdoor-air temperature broadcast and global occupancy broadcast. When the optional expansion I/O board is employed, it will: perform a periodic scan and maintain a database of expanded I/O points; perform Fire/Smoke control (power exhaust required); if in Occupied mode, perform IAQ control and monitor the fan, filter, demand limit, and field-applied status (with accessories).

If thermostats are used to energize the G input, the control module will turn on the indoor fan without delay and open the economizer dampers to minimum position. If thermostats are used to deenergize the G input, the control module will turn off the indoor fan without delay and close the economizer dampers.

When cooling, G must be energized before cooling can operate. The control module determines if outdoor conditions are suitable for economizer cooling using the standard outdoor air thermistor. For the economizer to function for outside air cooling: the enthalpy must be below the enthalpy set point; the outdoor-air temperature must be equal to or less than the High Outdoor Air Temperature Lockout (default is 65 F); the SAT (supply-air temperature) thermistor must not be in alarm; and the outdoor air reading is available. When these conditions are satisfied, the control module will use economizer as the first stage of cooling.

When Y1 input is energized, the economizer will be modulated to maintain SAT at the defined set point. (The default is 55 F.) When SAT is above the set point, the economizer will be 100% open. When SAT is below the set point, the economizer will modulate between minimum and 100% open position. When Y2 is energized, the control module will turn on compressor 1 and continue to modulate the economizer as described above. If the Y2 remains energized and the SAT reading remains above the set point for 15 minutes, compressor 2 will turn on. If Y2 is deenergized at any time, only the last stage of compression that was energized will be turned off. If outdoor conditions are not suitable for economizer cooling, the economizer will go to minimum position and cycle compressors 1 and 2 based on demand from Y1 and Y2 respectively. The compressors will be locked out when the SAT temperature is too low (less than 40 F for compressor 1 and less than 45 F for compressor 2). After a compressor is locked out, it can restart after normal time-guard period.

The Time Guard® function maintains a minimum off time of 5 minutes, a minimum on time of 10 seconds, and a minimum delay before starting the second compressor of 10 seconds.

Heating — The control module is powered by 24 vac. If the unit is controlled with a room sensor, the fan will run continuously in the Occupied mode, with the outside-air damper in the minimum position. If the unit is controlled through a room thermostat (with FAN set to AUTO), upon a call for heat the first stage heat is energized, energizing heat relay (HR2) and reversing valve solenoids (RVS1 and 2). Compressor no. 1 and 2, indoor and outdoor-fan motors start. Upon a call for additional heat (if equipped with electric heaters), the second stage of heat is energized. When the call for heat is satisfied, the compressors, fan motors, and heaters will be deenergized and the outdoor-air damper will move to the closed position.

If the unit is controlled with a room sensor the fan will not run in the Unoccupied mode unless the space temperature is below the unoccupied heat set point or above the unoccupied cool set point. Upon a call for heat, the first stage of heat is energized, energizing heat relay (HR2) and reversing valve solenoids (RVS1 and 2). Compressor no. 1 and 2,

indoor and outdoor-fan motors start, and the outdoor-air damper will move to the Unoccupied IAQ position (generally set to zero in the Unoccupied mode). The IAQ feature is enabled through system software. Upon a call for additional heat (if equipped with electric heaters), the second stage of heat is energized. When the call for heat is satisfied, the compressors, fan motors, and heaters will be deenergized and the outdoor-air damper will move to the closed position.

Defrost Cycle — When the temperature of the outdoor coil drops below 28 F as sensed by the defrost thermostat (DFT1 or 2) and the defrost timer is at the end of a timed period (adjustable at 30 to 90 minutes) the defrost cycle will begin. See Fig. 31. The control board will deenergize the reversing valve solenoids (RVS1 and 2) and energize the electric heat. Also, the outdoor-fan motor will stop.

The unit will continue to defrost until the coil temperature as measured by DFT1 and 2 reaches 65 F or the duration of defrost cycle completes a 10-minute period.

During the defrost mode, if a circuit defrosts first, the RVS will oscillate between heating and cooling modes until defrost mode is complete. This will keep the head pressure on that circuit from getting too high.

At the end of the defrost cycle, the electric heaters will be deenergized, reversing valve solenoids will be energized, and the outdoor fan will start.

POWER EXHAUST OPERATION — The optional power exhaust packages are factory- or field-installed with vertical units and optionally installed in the return air ductwork for horizontal applications. The standard and optional modulating power exhaust are the 2 packages available. The modulating power exhaust package is equipped with a field-adjustable static pressure controller which will control up to 4 power exhaust stages to maintain a building static pressure. The blue sequencer located in the control box below the control board can be adjusted by removing the covers and adjusting the set point dial to the desired building pressure. The standard power exhaust package controls up to 2 stages of power exhaust to maintain building pressure. These power exhaust stages are staged according to a percentage of the economizer damper position. The default values are 25% for Stage 1 and 75% for Stage 2. This package has set points that are adjustable through software (such as Service Tool, Building Supervisor, or ComfortWorks™).

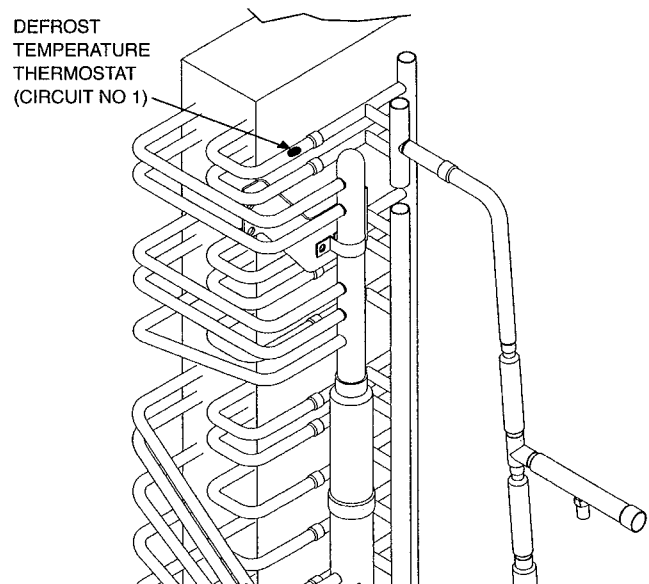


Fig. 31 — Defrost Temperature Thermostat Location

NOTE: For 50EWQ applications, the factory-supplied wiring harness will allow for return duct mounting of the power exhaust assembly within 12 ft of the unit. The harness is approximately 16 ft long.

SPACE TEMPERATURE OFFSET — An accessory space temperature sensor (T-56) will allow an offset of the space temperature set point $\pm 5^\circ\text{F}$. The 4 to 20 mA signal corresponds to a 0° to 20°F offset. The reset ratio set point is used to modify the offset temperature range. See Fig. 32 for space temperature sensor wiring.

DISABLING THE ECONOMIZER — For applications where the economizer will not be used (areas of high humidity), the economizer will need to be disabled. Be sure to turn off electrical power before attempting this procedure. The economizer is best disabled by breaking the splice connecting the violet wire coming from T24 on the base module board and the red wire coming from T29 on the base module board.

The splice is made where the OAT (outdoor air thermostat) is located (at the right hand outdoor air damper area). Remove the wire nut from the violet to red wire splice. Cap off both wires so the connection is broken. When the connection is broken, the base module is fooled into thinking that the enthalpy is not acceptable and economizer operation is disabled.

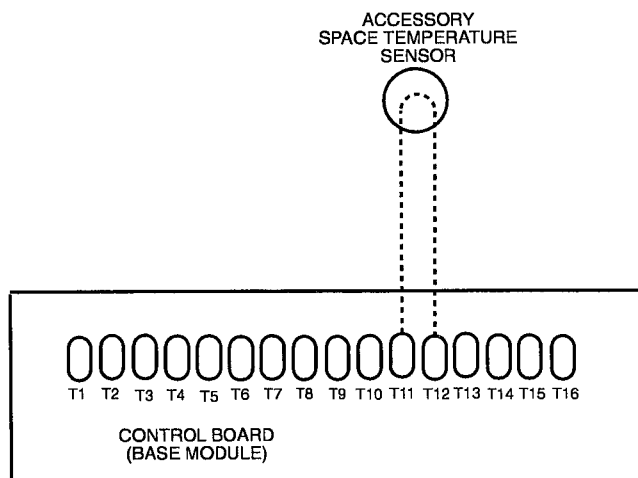


Fig. 32 — Space Temperature Sensor Wiring

CAPACITY CONTROL, COOLING — The cooling capacity staging table is shown in Table 14.

Table 14 — Cooling Capacity Staging Table, Units with 2 Compressors

STAGES	0	1 ECONOMIZER	2	3
Compressor 1	Off	Off	On	On
Compressor 2	Off	Off	Off	On

NOTE: On units that require additional unloading, add suction pressure unloaders on Compressor 1 only

FIELD TEST — The field test program is initiated by moving up DIP switch no. 4 to the OPEN position. The outdoor-air damper will close. The control allows 90 seconds for the damper to close in case it was in the full open position. Next, the indoor-fan contactor will be energized, and the outside-air damper will begin to open to its default value of 20% and stay at that position for a short period of time. The outdoor-air damper will then open to its full open position and stay at that position for a short period of time. The outdoor-air damper will then close.

If the unit is equipped with power exhaust, stage 1 will be energized for 5 seconds. If the unit is configured for stage 2

of power exhaust, stage 2 will be energized for 5 seconds after the first stage is deenergized.

The first stage of heat will be energized for 30 seconds, after which the second stage heat will be energized for an additional 30 seconds. Heat is then deenergized.

The last step is the Cooling mode. Outdoor-fan contactor no. 1 is energized. This is followed by each stage of cooling energized with a 10-second delay between stages. After this is complete, outdoor-fan contactor no. 2 is energized for 10 seconds.

The compressors will now deenergize, followed by the outdoor-fan contactors and indoor-fan contactors.

The field test is then complete.

TIME GUARD® CIRCUIT — The Time Guard function (built into the unit control module board) maintains a minimum off time of 5 minutes and a minimum on time of 10 seconds.

CRANKCASE HEATER — The unit main power supply must remain on to provide crankcase heater operation. The crankcase heater in each compressor keeps oil free of refrigerant while compressor is off.

HEAD PRESSURE CONTROL — Each unit has a fan cycling, outdoor thermostat to shut off outdoor-fan motor(s) at 55 F. The head pressure control permits the unit to operate with correct condensing temperatures down to 35 F outdoor-air temperature if the economizer is disabled.

MOTORMASTER® III DEVICE — The Motormaster III Solid-State Head Pressure Control is a field-installed accessory, fan speed control device actuated by a temperature sensor. The Motormaster III device is specifically designed for use on Carrier equipment and controls the outdoor-fan motor speed in response to the saturated condensing temperature. For outdoor temperatures down to -20°F , the Motormaster III device maintains condensing temperature at 100 F.

SERVICE

⚠ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Turn off accessory heater power switch if applicable. Electrical shock could cause personal injury.

Service Access — All unit components can be reached through clearly labelled hinged access doors. These doors are not equipped with tiebacks, so if heavy duty servicing is needed, either remove them or prop them open to prevent accidental closure.

Each door is held closed with 3 latches. The latches are secured to the unit with a single $\frac{1}{4}$ -in. - 20 x $\frac{1}{2}$ -in. long bolt. See Fig. 33.

To open, loosen the latch bolt using a $\frac{7}{16}$ -in. wrench. Pivot the latch so it is not in contact with the door. Open the door. To shut, reverse the above procedure.

NOTE: Disassembly of the top cover may be required under special service circumstances. It is very important that the orientation and position of the top cover be marked on the unit prior to disassembly. This will allow proper replacement of the top cover onto the unit and prevent rainwater from leaking into the unit.

IMPORTANT: After servicing is completed, make sure door is closed and relatched properly, and that the latches are tight. Failure to do so can result in water leakage into the evaporator section of the unit.

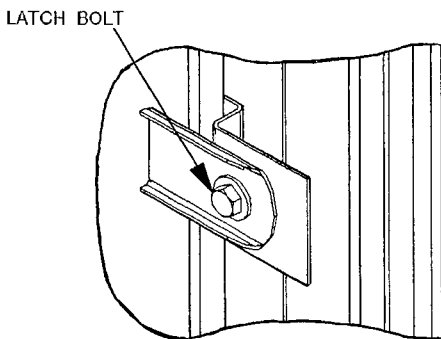


Fig. 33 — Door Latch

Cleaning — Inspect unit interior at beginning of each heating and cooling season and as operating conditions require. Remove unit top panel and/or side panels for access to unit interior.

INDOOR COIL — Clean as required with a commercial coil cleaner.

OUTDOOR COIL — Clean outdoor coil annually and as required by location and outdoor-air conditions. Inspect coil monthly — clean as required.

CONDENSATE DRAIN — Check and clean each year at start of cooling season. In winter, keep drains and traps dry.

FILTERS — Clean or replace at start of each heating and cooling season, or more often if operating conditions require. Refer to Table 1 for type and size.

NOTE: The unit requires industrial grade throwaway filters capable of withstanding face velocities up to 625 fpm.

OUTDOOR-AIR INLET SCREENS — Clean screens with steam or hot water and a mild detergent. Do not use throw-away filters in place of screens.

Lubrication

COMPRESSORS — Each compressor is charged with the correct amount of oil at the factory. The correct oil charge is shown in Table 1. If oil is visible in the compressor sight glass, check unit for operating readiness as described in Start-Up section, then start the unit. Observe oil level and add oil, if required, to bring oil level in compressor crankcase up to between $\frac{1}{4}$ and $\frac{1}{3}$ of sight glass during steady operation.

If oil charge is above $\frac{1}{3}$ sight glass, do not remove any oil until the compressor crankcase heater has been energized for at least 24 hours with compressor off.

When additional oil or a complete charge is required, use only Carrier-approved compressor oil:

Petroleum Specialties, Inc. Cryol 150
 Texaco, Inc. Capella WF-32
 Witco Chemical Corp. Suniso 3GS

IMPORTANT: Do not use reclaimed oil or oil that has been exposed to the atmosphere. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants section, for procedures to add or remove oil.

FAN SHAFT BEARINGS — Lubricate the bearings at least twice annually with suitable bearing grease. Do not over grease. Typical lubricants are show below:

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Mobil	Mobilplex EP No 1
Sunoco	Prestige 42
Texaco	Multifak 2

*Preferred lubricant because it contains rust and oxidation inhibitors

OUTDOOR AND INDOOR-FAN MOTOR BEARINGS — The outdoor and indoor-fan motors have permanently-sealed bearings, so no field lubrication is necessary.

Indoor Fan Performance Adjustment (Fig. 34)

— Fan motor pulleys are factory set for speed shown in Table 1 (factory speed setting).

To change fan speeds, change pulleys.

To align fan and motor pulleys:

1. Shut off unit power supply.
2. Loosen fan shaft pulley bushing.
3. Slide fan pulley along fan shaft.
4. Make angular alignment by loosening motor from mounting plate.
5. Retighten pulley.

IMPORTANT: Check to ensure that the unit drive matches the duct static pressure in Tables 11.

Indoor Fan Service and Replacement

1. Turn off unit power.
2. Remove supply-air section panels.
3. Remove belt and blower pulley.
4. Loosen set screws in blower wheels.
5. Remove locking collars from bearings.
6. Remove shaft.
7. Remove venturi on opposite side of bearing.
8. Lift out wheel.
9. Reverse above procedure to reinstall fan.
10. Check and adjust belt tension as necessary.

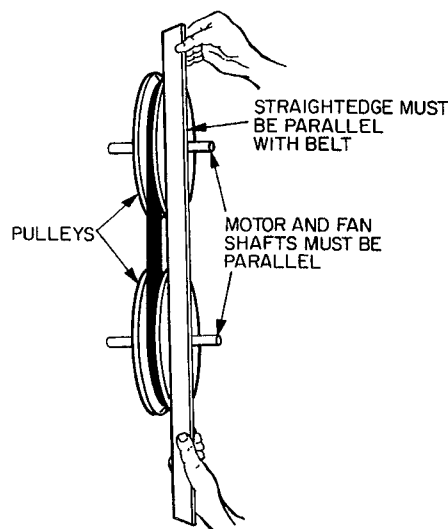


Fig. 34 — Indoor-Fan Pulley Alignment and Adjustment

Belt Tension Adjustment — To adjust belt tension:

1. Remove power to unit.
2. Remove motor mount nuts and bolts.
3. Loosen fan motor nuts. See Fig. 35.
4. Turn motor jacking bolts to move motor mounting plate left or right for proper belt tension. A slight bow should be present in the belt on the slack side of the drive while running under full load.
5. Tighten nuts.
6. Adjust bolts and nut on mounting plate to secure motor in fixed position. Recheck belt tension after 24 hours of operation. Adjust as necessary.

Outdoor-Fan Adjustment

1. Shut off unit power supply.
2. Remove fan guard.
3. Loosen fan hub setscrews.
4. Adjust fan height on shaft using a straightedge placed across venturi and measure per Fig. 36.
5. Tighten setscrews and replace fan guard.
6. Turn on unit power.

Indoor-Fan Motor Replacement

1. Shut off unit power supply.
2. Remove upper outside panel and open hinged door to gain access to motor.

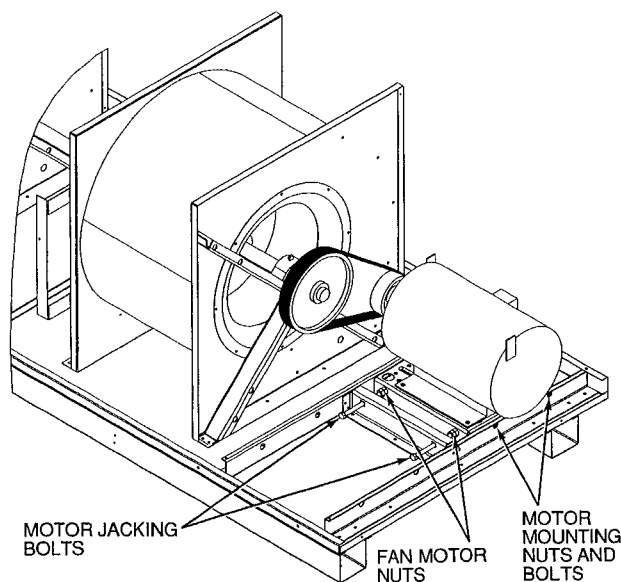


Fig. 35 — Belt Tension Adjustment

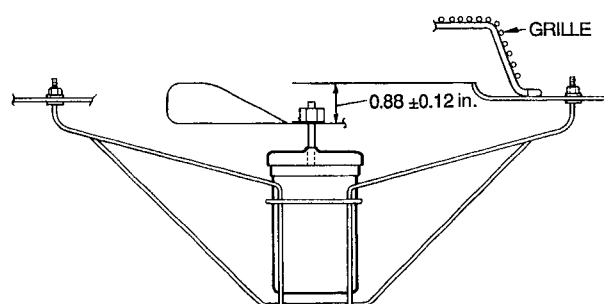


Fig. 36 — Outdoor-Fan Adjustment

3. Fully retract motor plate adjusting bolts.
4. Loosen the 2 rear (nearest the indoor coil) motor plate nuts.
5. Remove the 2 front motor plate nuts and carriage bolts.
6. Slide motor plate to the rear (toward the coil) and remove fan belt(s).
7. Slide motor plate to the front and hand tighten one of the rear motor plate nuts (tight enough to prevent the motor plate from sliding back but loose enough to allow the plate to pivot upward).
8. Pivot the front of the motor plate upward enough to allow access to the motor mounting hex bolts and secure in place by inserting a prop.
9. Remove the nuts from the motor mounting hex bolts and remove motor.
10. Reverse above steps to install new motor.

Power Failure — Dampers have a spring return. In event of power failure, dampers will return to fully closed position until power is restored.

Refrigerant Charge — Amount of refrigerant charge is listed on unit nameplate and in Table 1. Refer to Carrier GTAC II; Module 5; Charging, Recovery, Recycling, and Reclamation section for charging methods and procedures.

Unit panels must be in place when unit is operating during charging procedure.

NO CHARGE — Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant (refer to Table 1).

LOW CHARGE COOLING — Using cooling charging chart (see Fig. 37), add or remove refrigerant until conditions of the chart are met. Indoor-air cfm must be within normal operating range of unit. Take outdoor ambient temperature and read the suction pressure gage. Refer to chart to determine correct suction temperature. If intersection point on chart is above the curve, add refrigerant. If intersection point on chart is below curve, carefully recover some of the charge. Recheck suction pressure as charge is adjusted.

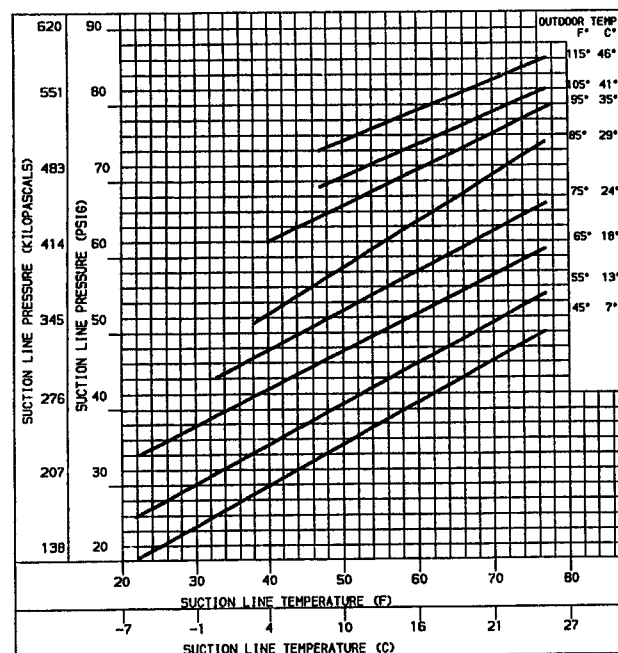


Fig. 37 — Cooling Charging Chart, Sizes 024,028

Filter Drier — Replace whenever refrigerant system is exposed to atmosphere.

Protective Devices

COMPRESSOR PROTECTION

Overcurrent — Each compressor has one manual reset, calibrated trip, magnetic circuit breaker. Do not bypass connections or increase the size of the circuit breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

Overtemperature — Each 06D type compressor has an internal protector to protect it against excessively high discharge gas temperatures.

Crankcase Heater — Each compressor has a crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. Since power for the crankcase heaters is drawn from the unit incoming power, main unit power must be on for the heaters to be energized.

IMPORTANT: After a prolonged shutdown or service job, energize the crankcase heaters for 24 hours before starting the compressors.

INDOOR-FAN MOTOR PROTECTION — A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker. If the indoor-fan motor is replaced with a different horsepower motor, resizing of the circuit breaker is required. Contact Carrier Application Engineering.

OUTDOOR-FAN MOTOR PROTECTION — Each outdoor-fan motor is internally protected against overtemperature.

HIGH- AND LOW-PRESSURE SWITCHES — If either switch trips, or if the compressor overtemperature switch activates, that refrigerant circuit will be automatically locked out. To reset, manually move the thermostat setting.

FREEZE PROTECTION THERMOSTAT (FPT) — An FPT is located on the evaporator coil for each circuit. It detects frost build-up and turns off the compressor, allowing the coil to clear. Once the frost has melted, the compressor can be reenergized.

Relief Devices — All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices are installed on the suction line, liquid line, and on the compressor.

Control Circuit, 24-V — This control circuit is protected against overcurrent by a 3.2-amp circuit breaker (CB4). Breaker can be reset. If it trips, determine cause of trouble before resetting.

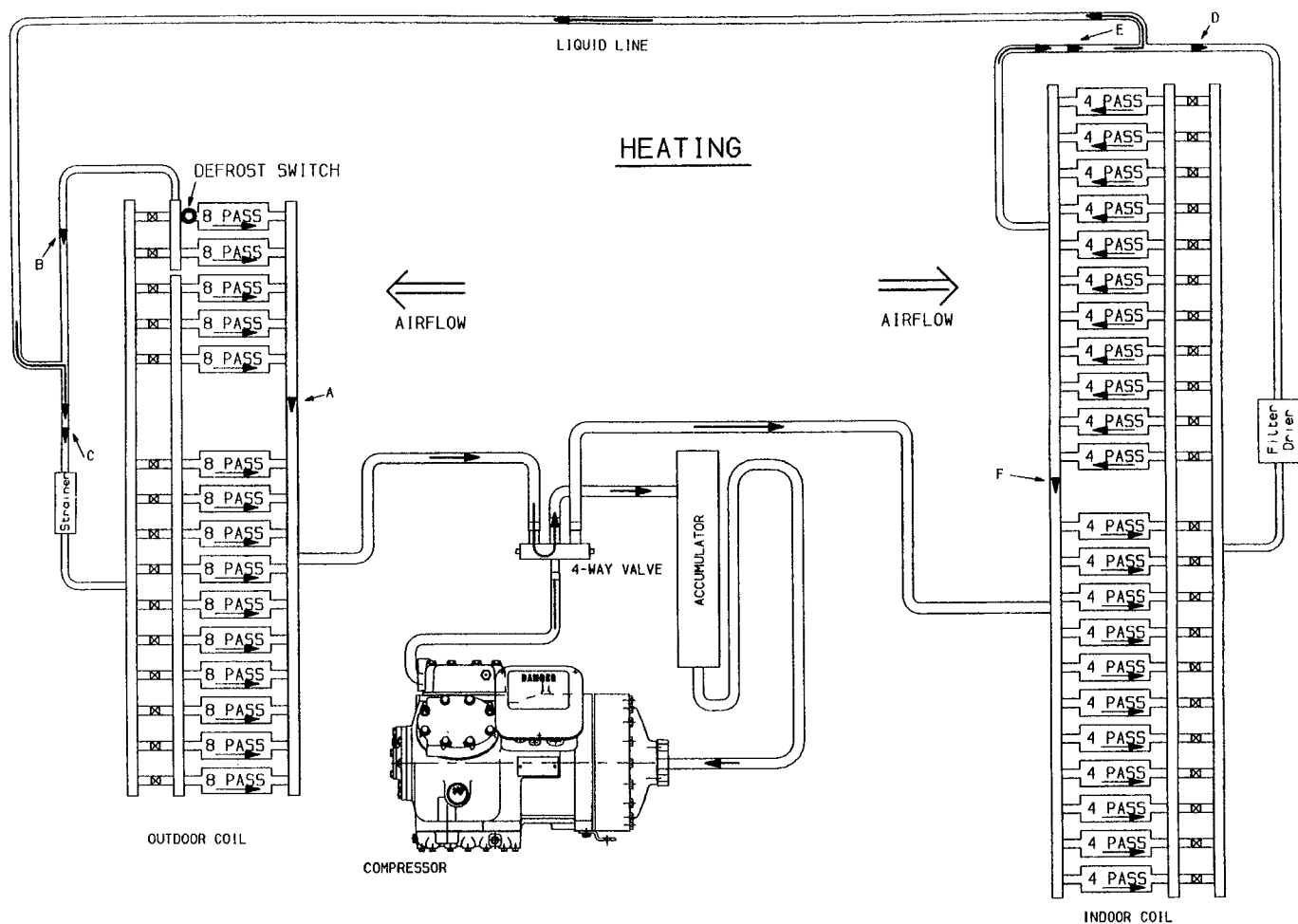
Control Circuit, 115-V — This control circuit is protected against overcurrent by a 5.0-amp circuit breaker (CB3). Breaker can be reset. If it trips, determine cause of trouble before resetting.

Compressor Lockout Logic — If any of the safeties trip, the circuit will automatically reset (providing the safety has reset) and restart the compressor in 15 minutes. If any of the safeties trip 3 times within a 90-minute period, then the circuit will be locked out and will require manual resetting by turning off either the unit disconnect or the control circuit breaker, or opening the thermostat.

Replacement Parts — A complete list of replacement parts may be obtained from any Carrier distributor upon request.

TROUBLESHOOTING

Typical heating and cooling refrigerant circuiting diagrams are shown in Fig. 38 and 39.



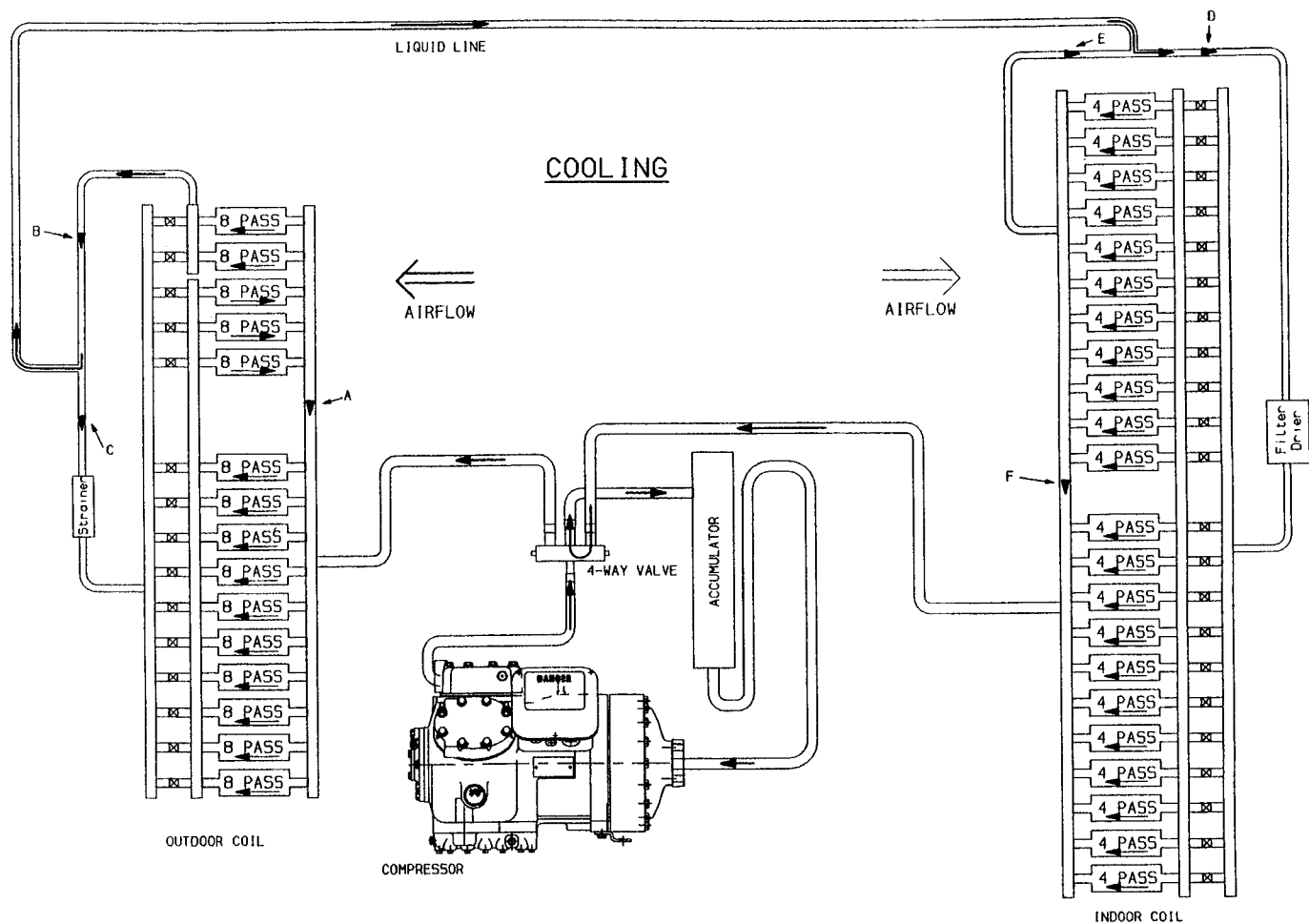
CHECK VALVES

	COOLING	HEATING
A	Closed	Open
B	Open	Closed
C	Closed	Open
D	Open	Closed
E	Closed	Open
F	Open	Closed

NOTES:

1. Hot gas from compressor flows through the 4-way valve and is directed to the indoor coil header. At the header it is condensed and subcooled. Refrigerant leaves the indoor coil by way of the check valve to the liquid line.
2. The refrigerant then flows through a strainer and feeds the outdoor coil by way of fixed orifice tubes on each circuit.
3. Each circuit evaporates the refrigerant, and the circuits are combined in the outdoor coil header with some of the circuits flowing through the check valve.
4. The refrigerant then flows through the 4-way valve, accumulator and back to the compressor.

Fig. 38 — Typical Refrigerant Circuiting (Heating)



CHECK VALVES

	COOLING	HEATING
A	Closed	Open
B	Open	Closed
C	Closed	Open
D	Open	Closed
E	Closed	Open
F	Open	Closed

NOTES:

- 1 Hot gas from compressor flows through the 4-way valve and is directed to the outdoor coil header. At the header it is condensed and subcooled through converging circuits (10-3-2). Refrigerant leaves the outdoor coil by way of the check valve to the liquid line
- 2 The refrigerant then flows through the filter drier and feeds the indoor coil by way of fixed orifice tubes on each circuit
- 3 Each circuit evaporates the refrigerant, and the circuits are combined in the indoor coil header with some of the circuits flowing through the check valve
- 4 The refrigerant then flows through the 4-way valve, accumulator and back to the compressor.

Fig. 39 — Typical Refrigerant Circuiting (Cooling)

Diagnostic LEDs (Light-Emitting Diodes) — There are 3 LEDs (red, yellow, and green) on the lower left hand side of the control board. The red light is used to check unit operation and alarms. A constant pulse is normal unit operation. A series of quick blinks indicates an alarm. Refer to Table 15 on next page for a description of alarms. The

yellow LED blinks during transmission with the CCN (Carrier Comfort Network). The green LED blinks during transmission with the expansion board.

Channel Designations — Tables 16-17 show the input and output channel designations.

Table 15 — Control Board LED Alarms

LED BLINKS	ERROR CODE	DESCRIPTION	TROUBLESHOOTING COMMENTS
1	—	Normal Operation	The expansion board and control board flash the red LED in one-second intervals when the board is operating properly.
2	HF-13	Compressor 1 Safety	The high or low pressure safety switch for compressor no. 1 has opened for 3 seconds. The error will be cleared and compressor no. 1 will be allowed to turn on in 15 minutes. If the safeties have been tripped 3 times in 90 minutes, compressor no. 1 will be locked out until the control board has been manually reset.
3	HF-14	Compressor 2 Safety	The high or low pressure safety switch for compressor no. 2 has opened for 3 seconds. The error will be cleared and compressor no. 2 will be allowed to turn on in 15 minutes. If the safeties have been tripped 3 times in 90 minutes, compressor no. 2 will be locked out until the control board has been manually reset.
4	HF-15	Thermostat Failure	The thermostat is calling for both heating and cooling at the same time. The unit will operate on a first call basis and will automatically reset.
5	HF-05	SAT Thermistor Failure	The supply-air temperature (SAT) sensor has failed. First check for wiring errors, then replace sensor.
6	HF-06	OAT Thermistor Failure	The outside-air temperature (OAT) sensor has failed. First check for wiring errors, then replace sensor.
7	HF-03	Space Temp Sen Failure	The space temperature sensor has failed. First check for wiring errors, then replace sensor.
8	HF-12	RAT Thermistor Failure	The return-air temperature (RAT) sensor has failed. Ensure that DIP switch position 1 is in the closed position and reset power. Then check for wiring errors. Finally, replace sensor.
9	SE-05	Loss of Communications with Expansion board	Communications between the expansion board and the control board have been interrupted. Ensure that an expansion board is installed and wired using the wire harness supplied with the expansion module. If an expansion board is not used ensure that DIP switch position 3 is in the closed position, and reset power.
10	HF-16	Control Board Failure	Generated when hardware has failed on control board. Replace the control board.
11	HF-17	Expansion Board Failure	Generated when hardware has failed on the expansion board. Replace the expansion board.

LEGEND

DIP — Dual In-Line Package
LED — Light-Emitting Diode

Table 16 — I/O Channel Designations Base Module

TERMINAL NO.	ASSIGNMENT
T1-2	SPT (CCN) — 10K Ω Thermistor
T3-4	STO (CCN) — 10K Ω Thermistor
T5-6	OAT — 5K Ω Thermistor
T7-8	SAT — 5K Ω Thermistor
T9-10	—
T11-12	—
T13-14	—
T15-16	—
T17-25	Y1 — DI (24 vac)
T18-25	Y2 — DI (24 vac)
T19-25	W1 or Remote Start/Stop — DI (24 vac)
T20-25	W2 — DI (24 vac)
T21-25	G — DI (24 vac)
T22-25	Compressor 1 Safety — DI (24 vac)
T23-25	Compressor 2 Safety — DI (24 vac)
T24-25	Outside Air Enthalpy — DI (24 vac)
T26-27	Economizer Pos. — AO (4-20 mA)
T28-29	Heat 1 Relay — DO (24 vac)
T30-29	Heat 2 Relay — DO (24 vac)
T31-32	Power Exhaust 1/Modulating Pwr Exht — DO (115 vac)
T33-32	Power Exhaust 2 — DO (115 vac)
T34-35	Condenser Fan — DO (115 vac)
T36-35	OFC2 — DO (115 vac)
T37-38	Reversing Valve Solenoid No. 1
T39-38	Reversing Valve Solenoid No. 2
K1	Indoor Fan Relay — DO (HV)
K2	Compr 1 — DO (HV)
K3	Compr 2 — DO (HV)

LEGEND

AO — Analog Output
CCN — Carrier Comfort Network
DI — Direct Input
DO — Direct Output
HV — High Voltage
K Ω — Kilo-Ohms
OAT — Outdoor-Air Temperature
OFC — Outdoor Fan Contactor
SAT — Supply-Air Temperature
SPT — Space Temperature
STO — Space Temperature Offset
T — Terminal

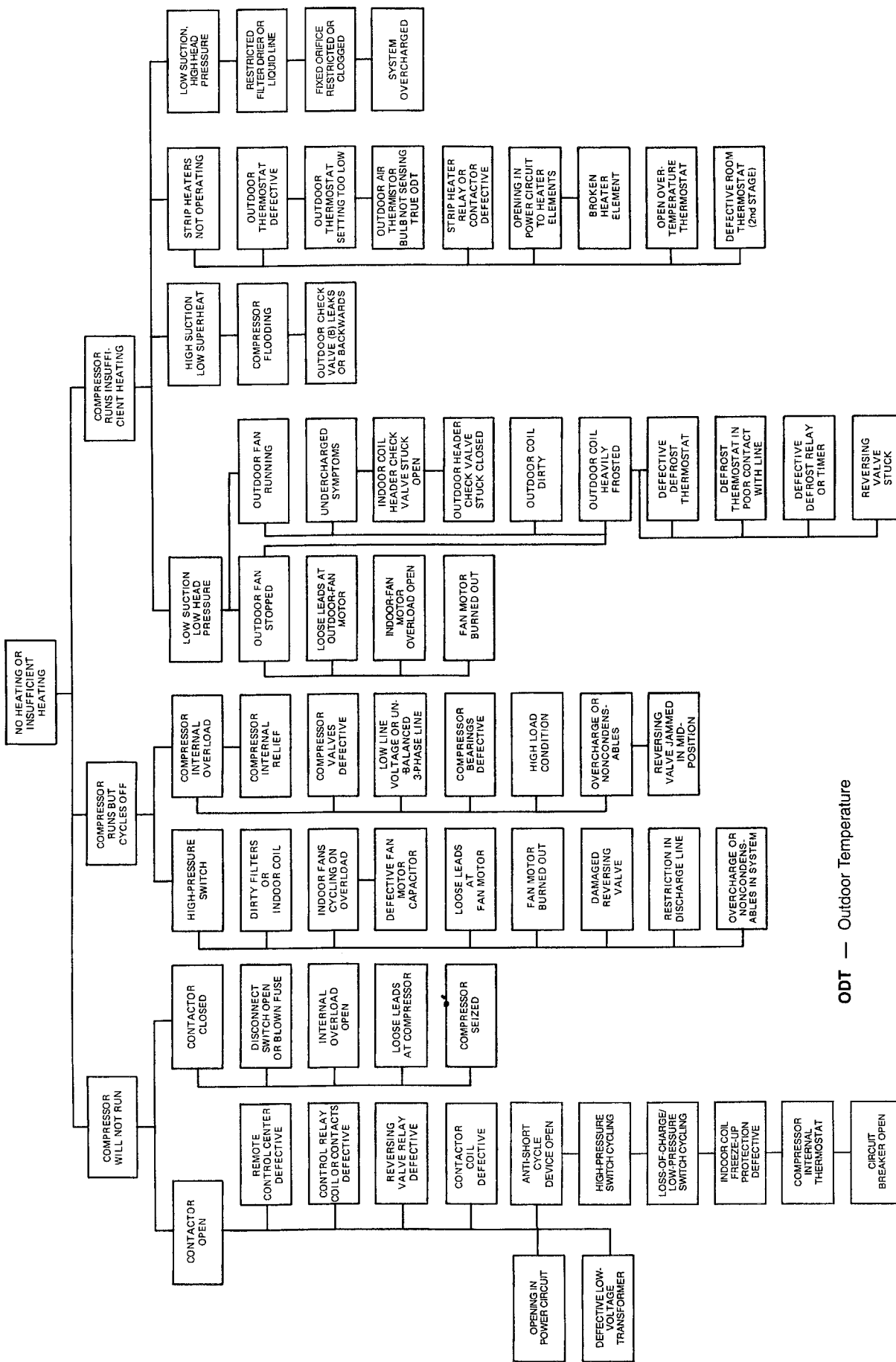
Table 17 — I/O Channel Designations Expansion Module

TERMINAL NO.	ASSIGNMENT
T1-2	—
T3-4	—
T5-6	—
T7-8	—
T9-10	—
T11-12	IAQ Indoor — AI (4-20 mA)
T13-14	IAQ Outdoor — AI (4-20 mA)
T15-16	—
T17-25	Fan Status — DI (24 vac)
T18-25	Filter Status — DI (24 vac)
T19-25	Field Applied Status — DI (24 vac)
T20-25	Demand Limit — DI (24 vac)
T21-25	Fire — Unit Shutdown — DI (24 vac)
T22-25	Fire — Pressurization — DI (24 vac)
T23-25	Fire — Evacuation — DI (24 vac)
T24-25	Fire — Smoke Purge — DI (24 vac)
T26-27	—
T28-29	—
T30-29	Alarm Light Indicator — DO (24 vac)
T31-32	Power Exhaust Fire #1 — DO (115 vac)
T33-32	Power Exhaust Fire #2 — DO (115 vac)
T34-35	Power Exhaust Fire #3 — DO (115 vac)
T36-35	Power Exhaust Fire #4 — DO (115 vac)
T37-38	—
T39-38	—
K1	—
K2	—
K3	—

LEGEND

AI — Analog Input
DI — Direct Input
DO — Direct Output
IAQ — Indoor Air Quality
T — Terminal

TROUBLESHOOTING CHART, HEATING CYCLE



NO COOLING OR INSUFFICIENT COOLING

COMPRESSOR WILL NOT RUN

COMPRESSOR RUNS BUT CYCLES OFF

COMPRESSOR RUNS, INSUFFICIENT COOLING

CONTACTOR OPEN

CONTACTOR CLOSED

HIGH-PRESSURE SWITCH

COMPRESSOR INTERNAL PROTECTION

INDOOR COIL FREEZE-UP PROTECTION

LOW SUCTION LOW HEAD PRESSURE

HIGH SUCTION LOW HEAD PRESSURE

HIGH SUCTION LOW SUPERHEAT

LOW SUCTION HIGH HEAD PRESSURE

LIQUID LINE PARTIALLY RESTRICTED

PARTIALLY RESTRICTED FILTER DRIER

INDOOR COIL FIXED ORIFICE RESTRICTED

OUTDOOR CHECK VALVE NOT FULLY OPEN

INDOOR CHECK VALVE LEAKING OR BACKWARDS

COMPRESSOR FLOODING

REVERSING VALVE STUCK OR INTERNAL LEAK

DEFECTIVE COMPRESSOR

DIRTY AIR FILTERS

DUCT RESTRICTED

DAMPERS PARTIALLY CLOSED

COIL FROSTED

LOW ON REFRIGERANT SYMPTOM

OUTDOOR COIL HEADER CHECK VALVE STUCK OPEN

INDOOR COIL HEADER CHECK VALVE STUCK CLOSED

OPENING IN POWER CIRCUIT

DEFECTIVE LOW-VOLTAGE TRANSFORMER

CONTROL RELAY COIL OR CONTACTS DEFECTIVE

INDOOR COIL FREEZESTAT

CONTACTOR OR COIL DEFECTIVE

DEFECTIVE REMOTE CONTROL CENTER

LOOSE ELECTRICAL CONNECTION

ANTI-SHORT CYCLE DEVICE OPEN

HIGH-PRESSURE SWITCH CYCLING

LOSS-OF-CHARGE/LOW-PRESSURE SWITCH CYCLING NO CHARGE

INDOOR FREEZE-UP PROTECTION

COMPRESSOR INTERNAL THERMOSTAT

CIRCUIT BREAKER OVERLOAD PROTECTION

COMPRESSOR HOT

COMPRESSOR VALVES OR HEAD GASKETS

REVERSING VALVE STUCK

LINE VOLTAGE HIGH OR LOW

COMPRESSOR DEFECTIVE

INTERNAL RELIEF OPEN

OUTDOOR FAN STOPPED OR CYCLING ON OVERLOAD

LOOSE LEAD AT FAN MOTOR

MOTOR DEFECTIVE

OUTDOOR AIR RESTRICTED OR RECIRCULATING

DAMAGED REVERSING VALVE

RESTRICTED DISCHARGE LINE

OVERCHARGE OR NONCONDENSABLES IN SYSTEM

INDOOR FAN STOPPED

DEFECTIVE INDOR-FAN RELAY

LOOSE ELECTRICAL CONNECTIONS

BUILT-IN MOTOR OVERLOAD OPEN

FAN MOTOR DEFECTIVE

INDOOR FAN RUNNING

RESTRICTED INDOOR AIR

FROSTED COIL

LOW REFRIGERANT CHARGE

INDOOR FIXED ORIFICE RESTRICTED

LIQUID LINE RESTRICTED

RESTRICTED FILTER DRIER

OUTDOOR COIL LIQUID LINE CHECK VALVE STUCK

PACKAGED SERVICE TRAINING

Our packaged service training programs provide an excellent way to increase your knowledge of the equipment discussed in this manual. Product programs cover:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

A large selection of product, theory, and skills programs is available. All programs include a video cassette and/or slides and a companion booklet. Use these for self teaching or to conduct full training sessions.

For a free Service Training Material Catalog (STM), call 1-800-962-9212. Ordering instructions are included.

START-UP CHECKLIST

MODEL NO.: _____

SERIAL NO.: _____

DATE: _____

TECHNICIAN: _____

PRE-START-UP:

- ☐ VERIFY THAT DIP SWITCH SETTINGS ARE CORRECT
- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ REMOVE ALL SHIPPING HOLDDOWN BOLTS AND BRACKETS PER INSTRUCTIONS
- ☐ VERIFY INSTALLATION OF ECONOMIZER HOOD
- ☐ VERIFY INSTALLATION OF ALL OPTIONS AND ACCESSORIES
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTRUCTIONS
- ☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- ☐ CHECK THAT INDOOR-AIR FILTER IS CLEAN AND IN PLACE
- ☐ VERIFY THAT UNIT IS LEVEL WITHIN TOLERANCES
- ☐ CHECK FAN WHEELS AND PROPELLERS FOR LOCATION IN HOUSING/ORIFICE, AND VERIFY SET SCREW IS TIGHT
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ VERIFY THAT SUCTION AND DISCHARGE SERVICE VALVES ON EACH CIRCUIT ARE OPEN

START-UP

ELECTRICAL

SUPPLY VOLTAGE L1-L2 _____ L2-L3 _____ L3-L1 _____

COMPRESSOR AMPS — COMPRESSOR NO. 1 L1 _____ L2 _____ L3 _____
— COMPRESSOR NO. 2 L1 _____ L2 _____ L3 _____

SUPPLY FAN AMPS _____ EXHAUST FAN AMPS _____

ELECTRIC HEAT AMPS (IF SO EQUIPPED) L1 _____ L2 _____ L3 _____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ F DB (Dry-Bulb)

RETURN-AIR TEMPERATURE _____ F DB _____ F WB (Wet-Bulb)

COOLING SUPPLY AIR _____ F

HEAT PUMP SUPPLY AIR _____ F

ELECTRIC HEAT SUPPLY AIR (IF SO EQUIPPED) _____ F

PRESSURES

REFRIGERANT SUCTION CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

REFRIGERANT DISCHARGE CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

- ☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHART ON PAGE 27

CUT ALONG DOTTED LINE

OUT ALONG DOTTED LINE

- FILTER SIZES** _____ in.

[illegible]